MATH Lesson Plan

Lesson Title: COMPARING FRACTIONS

3rd Quarter Week 1

Standard(s):

4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

DOK 2: Compare the two fractions by showing <, =, > (without a model).

4/5_____2/8

DOK 3: Put these fractions in order from least to greatest.

1/3, 5/6, 1/8, 4/6, 5/8

4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Mathematical Practices: 1. Make sense of problems and persevere in solving them, 2. Reason abstractly and quantitatively, 3. Construct viable arguments and critique the reasoning of others, 4. Models with mathematics, 6. Attend to precision.

- **I can compare two fractions with different numerators and denominators.**
- **I can compare fractions, using < >, or =.**

Lesson Overview:	**Focus Question(s):**	**Lesson Objective(s):**
Students will compare fractions by using visual and numeric fraction models.	How can I tell if a fraction is greater than, less than, or equal to another fraction with a different denominator? Ex: Which is greater? 2/5 or 2/3	In this lesson, students will be able to **Compare** fractions that have like numerators and unlike denominators using visual and numeric representations with 80% accuracy.

	• How do we add fractions with like denominators? • How do we sum unit fractions? • How do we simplify fractions? • How do we add and subtract mixed numbers and improper fractions? • How do we solve word problems involving mixed numbers and improper fractions?	
Materials and Resources: District Curriculum Map Harcourt Brace-Mathematic Plus pg. 336-337 TE Lesson 10.9 fractions CCSS WB: PG. 617 **Resources (Textbook and Supplemental):** Blank Fraction Circles **Pizza Wheel (The link shows instructions for pizzas divided into four (4) and eight (8) slices. For this lesson students need to make one pizza divided into six (6)**	**Description of Lesson (including instructional strategies):** **Anticipatory Set: (optional)** Before the start of the lesson, review with students how fractions are parts of a whole. Using an ELMO, project the attached worksheet of blank fraction circles on the board. If an ELMO isn't available, use an overhead projector or provide students with individual copies. Facilitate a group discussion of how shading in parts of the whole creates the fraction, using the worksheet to provide students with a visual representation. Day 1-2: Comparing fractions Pg. 336-337 **Motivate – cooperative partners** Have students fold 1 paper strip in half, another in fourths, and another in eighths. Have partners confer to use the strips to answer the following questions. • How many fourths make a half? **2 fourths** • Which is greater, 5/8 or ¾? **¾** • Which is less, 3/8 or ¼? **¼** • Name 2 fractions equivalent to 1/2, **2/4, 4/8**	

slices and one pizza divided into eight(8) slices.) **Comparing Fractions Exit Cards** (attached to lesson) **Worksheet for Independent Practice** IndependentPractice ComparingFractions **Interactive Websites:** Balloon Fractions Game Compare Fractions Practice (use district map to click on the link for interactive websites) https://grade4commoncoremath.wikispaces.hcpss.org/4.NF.2	**Instruction and Strategies** **Day 1: Group discussions and examples** After the discussion, *have students pull out "Pizza Wheels."* These could have been done as a homework assignment from the previous day or you may have students create them as part of the lesson. See Resources for link to instructions on making "Pizza Wheels." Tell students to make one pizza that shows 1/6 and one pizza that shows 1/8. Ask the question "Which fraction is greater?" You want students to focus how the fractions are the same and how they are different both as a symbol and as a representation. As you are working on this particular lesson, be sure to keep numerators the same so students can compare using different denominators. *Students show 2/6 and 2/8.* Ask: "Which one is greater? Why?" *Students show 3/6 and 3/8.* Ask: "Which one is greater? Why?" Ask: "Does anyone see a pattern?" (Wait for student responses) If a student responds, say "Let's keep going to see if he/she is right." If there is no response, say "Let's start looking for a pattern." Continue with more examples: *Students show 4/6 and 4/8.* Ask: "Which one is greater? Why?" *Students show 5/6 and 5/8*. Ask: "Which one is greater? Why?" *Students show 6/6 and 6/8*. Ask: "Which one is greater? Why?" After all examples are given, ask students either: "Was (student responder) right?" OR "What pattern did we find?" Talk about the pattern (the fraction with 6 as the denominator was always greater*). Have students pair up and discuss why. [Think-Pair-Share]* *Regroup and call on pairs to share with class.* (Marzano: Nonlinguistic Representations/Reinforcing Effort and Providing Recognition/Cues, Questions, and Advanced Organizers)

Day 1-2: Comparing Fractions pg. 336-337

Quick Check: Circle the fractions that is not equivalent: Have students come up on the white board to circle the problems

1. ½ 6/18 5/10

2. 6/8, ¾, 2/3

3. 5/20, 3/10, 9/30

4. 2/3, 21/28, 24/36

Motivate: Cooperative Partners
Materials: 3 paper strips

Have students fold 1 paper strip in half, another in fourths, and another in eights. Have partners confer to use the strips to answer the following questions.

- How many fourths make a half? 2 fourths
- Which is greater, 5/8 or 3/4 ? explain. ¾
- Which is less, 3/8 or ¼? ¼
- Name 2 fractions equivalent to ½, 2/4, 4/8

Teach: Understanding the number relationships shown by numerical inequalities will help students as they solve the inequalities in algebra.
Discuss the warm up question. Possible answer: make models with fraction pieces.

Read about Shelby and Jodi. Discuss comparing like fractions and unlike fractions. Review the meaning of the symbols < and >.

Why is it easy to compare like fractions? Its like comparing whole numbers, because only the numerators need to be compared.

Critical thinking question: Explain how you can compare 2/3/ and ¾ by using a fraction bar divided into twelfths. Find equivalent fractions for 2/3 and ¾ with 12 as the denominator by holding an equal size fraction bar for thirds and fourths next to the one for twelfths; or find 2/3 of 12 and ¾ of 12 and then compare answers.

Check for understanding: After students complete exercises 1-5, have them explain to each other in a group how they distinguish between the symbols < and >. Possible answer: less than (<) begins small; greater than (>) begins big.

Wrap up: Summarize by discussing the wrap up question. A possible response from students: greater than; 4/8 is ½, and 5/8 is greater than 4/8.

Independent Practice: Pg. 336-337 #1-21 after students discuss in groups #1-5 and compare ideas.

Comparing Fractions Worksheet—Students will shade in the area to represent the fractions then compare the fractions with 80 percent accuracy. (Marzano: Homework and Practice)

Day 3: H22 – H23 To compare fractions – continue

Motivate: Cooperative groups

In groups of 3, have each student draw one of the following.

- A circle about as wide as your hand
  A circle about as wide as your finger

- A line about as long as your pencil
  A line about as long as a paper clip

- A group of 6 stars, X's, or dots
  A group of 10 stars, X's or dots

Have students shade their drawings to illustrate ½.

Have students compare their diagrams, and help them generalize that the size of ½ depends upon the size of the whole. You may wish to extend the concept by having students use the same diagrams to show ¼.

- If you look at your own drawing, which is larger, ½ or ¼? ½ answer
- Can you compare your ½ with someone else's ¼? No! why? Only fractions of the same whole can be compared.

Teach: As students complete the activities and the exercises, help them focus on answering the following and on using manipulatives to justify their answers.

- If denominators are the same, how do you choose the greater fraction? **By choosing the greater numerator**
- If numerators are the same, how do you choose the greater fraction? **By choosing the lesser denominator**
- How do you remember which symbol to use: < for is **less than** or > for is **greater than**? **Students should devise their own recall devices for the generalization; the open side points toward the greater number.**

Independent work: #1-16 pg. H23 Students work independently and then get in

	groups to correct and go over their problems. **Day 4: More Practice: Lesson 10.9 pg. 336-33 Mathematics Plus (orange book)/ Lesson 10.9 pg. H73** **Day 5:** Assessments: Use the online resources attached to this lesson or the worksheet provided. Review lessons Online resources for 4.NF.2 assessments: https://grade4commoncoremath.wikispaces.hcpss.org/Assessing+4.NF.2
Vocabulary Words: Fractions, like and unlike fractions Compare Fractions Equivalent Simplify Simplest form Numerator denominator	**Formative Assessment:** Fingers- Up Activity (Marzano: Reinforcing Effort and Providing Recognition) Ask *students to hold up fingers to represent their level of understanding for the following statement*: "I can tell if a fraction is greater than, less than, or equal to another fraction with a different denominator." *One means "I don't understand. I need help!"* – Small group instruction. Repeat instruction using "Pizza Wheel." *Two means "I think I've got it. I need a little help."* – Cooperative learning group with peers. *Three means "I got it!"* – Cooperative learning group with peers. **Day 5 Review/ Assessment – pg. 330 Review and Maintenance** **Chapter Review Test pg.340-341** **What Did I learn Activity? Pg 342-343** **Cumulative Review Test:** Pg. 345 Chapters 1-10 Online resources for 4.NF.2 assessments: https://grade4commoncoremath.wikispaces.hcpss.org/Assessing+4.NF.2
	Accommodations/Modifications: Based on the Fingers-Up Activity Formative Assessment, students with "one" can be re-taught in a small group. "Three" students can work with "two" students using Pizza Wheels for more independent practice [Think-Pair- Share]. (Marzano: Cooperative Learning)

Guam District Level Lesson Plan Quarter :3

Content: MATH	**Grade/Course**: 4TH	**Timeline**: WEEK 2-3

Standard(s): **4.NF.3a** Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

4.NF.3b Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

I Can estimate a fraction that is less than 1.
I can explore adding fractions that have like denominators and a sum less than 1.
I can subtract fractions that have like denominators and a different less than 1.

Lesson Overview:	**Lesson Objective(s)**:
Students will compare fractions by using visual and numeric fraction models.	In this lesson, students will be able to • Build and compare fractions in a set. • Explain why two fractions are equivalent even though they use different numbers.
Vocabulary: Fractions Numerators Denominator Common fractions Decimal fraction Equivalent Numerator Denominator Improper Mixed number Simplest form Simplify	**Focus Question(s)**: • How do we add fractions with like denominators? • How do we sum unit fractions? • How do we simplify fractions?

INSTRUCTIONAL STRATEGIES:

Thin Pair Share activity prior to Lesson (Optional)

In this lesson students use 1 inch square tiles to create designs that follow certain criteria.

“Using the tiles at your desk, create a design that is one half blue.”

Allow students a minute or two to create their design. As they do, circulate around the room looking for simple and creative examples to share with the class.

After students complete their designs, discuss some of the differences in the class.

- Did everyone use the same colors?
- Does everybody’s design look the same? Why not? How can that be since half of the design had

to be blue?

- Did everyone use the same amount of tile? Why or Why not?
- How did you decide what you were going to do to create this pattern?
- If we created another design, would you do it differently? How?

You may need to repeat this activity a few times before starting the Explore section of this lesson. Before moving on, students should see that there are many different options for each design. Just because the problem calls for a fraction in fourths, doesn't mean they need to use four tiles. They also need to understand that they may only receive part of the information needed to solve the problems; they will need to fill in the rest.

PROCEDURE:

1. Students work in pairs or threes, to build designs with one inch tiles, based on the description given on a task card.

   Each student builds their representation for the card. Once all students in the group have finished, they discuss their designs and decide on which one they will use for their representation for the class.

   Once the students agree upon the design, each student will copy it onto a sheet of 1 inch graph paper. Below the picture they are to write a description and an equation of all the colors used in their design.

   "Our design for card C has 1/8 yellow, 4/8 green and 3/8 red. 1/8 + 4/8 + 3/8 = 8/8 or 1 whole."
   Start with Card A and work towards Card H. Most groups will not be able to finish all 8 cards in the time allotted for the lesson.

EXPLAIN:

Bring all the students together and have them share the results of task cards A, B, and C.

Suggested questions

- What did you do for your task card?
- Do you think that this group's design fits the directions?
- How can you prove it?
- Compare two different designs, how are they similar and different?

Time permitting give the students 8 tiles and tell them that as a class you need to make a design that is 1⁄2 red, 1⁄4 green, 1/8 yellow and 1/8 blue.

Ask students to describe how they know how many tiles of the region match up to a specific fraction.

ELABORATE:

1. Have students create their own task cards. Students should use 24 total tiles and use the denominators 2, 3, 4, 6, 8 and 12.

   Students need to make sure that the fractions add up to 24/24ths or 1 whole.

   As students work, check to make sure that they have completed the puzzle and have written fractions in simplest form.

EVALUATIONS:

1. Formative: As students are building the designs circulate around the room checking for misunderstandings. Are students using only the minimum number of tiles, can they use more?

   How did they make the decision to use the number of tiles they did, and why did they choose these colors?

   Review the students' description for clarity.

   Summative: Have students collect their descriptions of each task card they were able to finish, and staple them together in a book

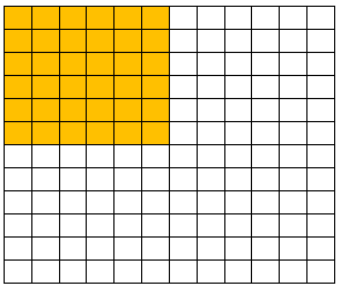
Common formative assessment pg. 637-657 of CCSS Workbook

Chapter 11 - Adding and Subtracting Fractions Essential Questions Pg. 348-349 Lesson 11.1

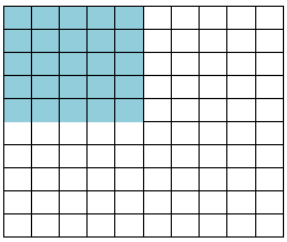
Instructional Strategies (EL, SIOP, SPED, Marzano)

The most important idea to stress in this Big Idea is the importance of the whole. You can only compare two fractions that have the same whole. It doesn't matter what model is used as long as it is the same. For example, here are two ways that students represent the value of 1⁄4. It appears that Melisa's 1⁄4 is greater than Nancy's 1⁄4. The problem is that they used different-sized grids as the whole. You can only compare values when the whole is the same.

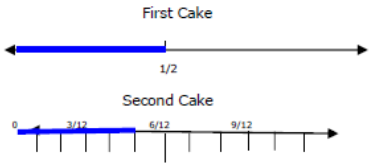
Examples should appear like these. You are looking at an area representation and a number line representation to compare two cakes. One has 1⁄2 left to eat and the other has 5/12 left to eat.



Melisa's grid



Nancy's grid



Day 1: Lesson 11.1 Estimating Fractions pg. 348 -349

Motivate : Whole Class activity
Draw the number line on the whiteboard for students to see.

_____
0 1/8 2/8 3/8 4/8 5/8 6/8 7/8 8/8

- What fraction is equivalent to ½? (4/8) 1 whole? (8/8)
- Is 1/8 closer to 0, ½, or 1? (**0**) How many steps is 1/8 from 0? (**1 step)** from ½? (**3 steps**) from 1? (7 **steps**)
- Is 5/8 closer to 0, ½, or 1? (**1/2**) How many steps is 5/8 from 0? (**5 steps**) from ½? (**1 step**) from 1? (**3 steps**)
- Is 7/8 closer to 0, ½, or 1? (**1**) How many steps is 7/8 from 0? (**7 steps**) from ½? (**3 steps**) from 1? (**1 step**)

Teach: Read about the baseball game to class. (pg.348)

- Can a baseball game ever have more than 9 innings? Explain. (yes; if there is a tie score after 9 innings.)

Building Understanding:
Materials: tracing paper, scissors

Have students work in cooperative groups to complete the task on page. 348. Have each group report on how they determined if a fraction was closer to 0, ½, or 1.

- How do you know when a fraction is close to 1? (when the numerator and the denominator are about the same)

Independent work: Have students work on # 1-14 Have students work on the first 4 problems together or as a group.

Summarize by asking students why it might be useful to know how to estimate fractions.

Day 2: Extra Practice Lesson 11.1, page H74 Do all. Correct each other and fix any errors.

Day 3: Lesson 11.2 Adding Fractions with Like Denominators pg. 350-351

Motivate: Cooperative Partners
Materials: For each pair – white paper, red crayon, blue crayon

Have pairs fold the paper into 4 equal parts and color 2/4 of the parts red and ¼ of the parts blue. Partners discuss the drawing and confer to answer the questions.

- What fraction of the paper is colored red or blue? ¾
- What is a number sentence that shows what you did? 2/4 + ¼ = ¾

Teach: Read about the game of Fizzle. Compare the fractions.

- Who scored more points? (Jamie's teammate)
- Look at the students in the photo. Describe how you think the game of Fizzle might be played. (Answers will vary)

Building understanding:
Materials: Fraction circles

Have students work in cooperative groups to complete the tasks on page 350. Have each group report on its discoveries.

- What addition sentences on page 350 is equivalent to the addition sentence 2/8 + 4/8 = _____? (2/4 + ¼ = _____) Why (**Addends are equivalent fractions**).
- Use your circle models to find 2 fractions that have a sum of 1/3 , (**1/6 + 1/6 = 2/6 = 1/3**)

Making the connections: Discuss the steps for adding fractions with like denominators. Have students complete exercises 1-3. Watch for students who add both the numerators and the denominators. Have these students refer to the fraction places.

DOK: Critical Thinking Strategy:

- How can you use mental math to add 3/5 + 1/5? (**When the denominators are the same, you can add the numerators mentally**.)

Independent work: #1-12 Have students work on the first 3 problems together. Correct and discuss the problems then work to complete the rest of the problems on their own. After completion, have students explain the sums and share their drawings for exercises 9-12.

- What did you notice about all the sums for exercises 4-8? (**Probable answer: All sums to be renamed in simplest form).**

Oral Assessments: Summarize by asking students to explain why the denominator is not added when adding fractions.

Homework or More practice Lesson 11.2, page H74 Do all and discuss each questions.

Day 4: Lesson 11.3 Subtracting fractions with like denominators Pg. 352-353

Quick Check: Before the lesson copy the following problems on the board and student answer. Give them 2 minutes to answer the problems on their notebook.

1. 1/8 + 3/8 = 4/8, or ½
2. 3/10 + 5/10 = 8/10, or 4/5
3. 2/8 + 5/8 = 7/8
4. 2/7 + 3/7 = 5/7

Motivate: cooperative partners
Materials: for each pair – paper strip, blue crayon

Have pairs fold a paper strip into 8 equal parts, color 5/8 blue, and place an X in 2/8 of the colored part.

Partners discuss the drawing and confer to answer the questions.

- How many of the colored parts do not have an X? (3 parts)
- What is a number sentence that shows what you did? (5/8 – 2/8 = 3/8)

Teach: Discuss the steps for subtracting fractions with like denominators. Have students complete exercises 1-3. Have a volunteer explain each problem at the whiteboard. Make sure students do not subtract denominators and realize that it is impossible to have zero as a denominator.

- How can you check a subtraction answer? Use addition. Example: Exercise 1: 3/5 = 1/5 = 4/5

Independent work: students after completing the ThinkPairShare with the group do the rest of the problems #4-14. Mixed Review 1-10 for extra practice or drill.

Critical Thinking Questions: How can you draw a fraction model to show 7/10 – 3/10? **Draw a model of ten tenths, and shade 7/10. Then cross out ¾, 4/10 will be the difference**. (comprehension)

Check for understanding: You may want students to check the answers with addition. However, remind students not to use the simplest-form fraction to check, because the denominators will be unlike.

Wrap up: Summarize y asking students to explain how subtracting fractions is similar to adding fractions.

GDOE CURRICULUM MAP: Resources & Links to Technology

Adding Fractions Using Circles

Adding Fractions Using Number Lines

Another Online Fraction Strip Interactive model that can be used to show equivalence

http://www.youtube.com/watch?v=pMSZnmwbKOw

This video extends into using visuals to add with unlike denominators. You can use this to extend the learning for those students that are ready.

Mathematics Plus: Lessons 11.1; 11.2; 11.3 Pgs. 348-353 / H74- lesson 11.1/11.2 / H75 Lesson 11.3

Accommodations/Modifications:

1. Intervention: Students who are struggling with this activity may need help in determining the number of tiles that will be found in their design. These students may need to start with very basic designs, using the minimum number of tiles.

   Extension: If I was only able to use a certain number of tiles in my design, create task cards that a class would be able to use. Ex. I can only use 16 tiles, so create a design with 1⁄4 blue, 1/8 green, 1⁄2 red and the rest yellow.

Resources (Textbook and Supplemental):

Adding Fractions Using Circles

Adding Fractions Using Number Lines

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http://publish.learningfocused.com/8317634

Guam District Level Lesson Plan Quarter :3

Content: MATH	**Grade/Course**: 4TH	**Timeline**: WEEK 3

4.NF.3c Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

4.NF.3d Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Review Lessons

Standard(s): **4.NF.3a** Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

4.NF.3b Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

I Can estimate a fraction that is less than 1.
I can explore adding fractions that have like denominators and a sum less than 1.
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Vocabulary: Fractions Numerators Denominator Common fractions Decimal fraction Equivalent Numerator Denominator Improper Mixed number Simplest form Simplify	**Focus Question(s)**: • How do we add fractions with like denominators? • How do we sum unit fractions? • How do we simplify fractions?

INSTRUCTIONAL STRATEGIES: Thin Pair Share activity prior to Lesson (Optional) In this lesson students use 1 inch square tiles to create designs that follow certain criteria. “Using the tiles at your desk, create a design that is one half blue.” Allow students a minute or two to create their design. As they do, circulate around the room looking for simple and creative examples to share with the class. After students complete their designs, discuss some of the differences in the class. • Did everyone use the same colors? • Does everybody’s design look the same? Why not? How can that be since half of the design had	

to be blue?

- Did everyone use the same amount of tile? Why or Why not?
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- If we created another design, would you do it differently? How?

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1. Students work in pairs or threes, to build designs with one inch tiles, based on the description given on a task card.

   Each student builds their representation for the card. Once all students in the group have finished, they discuss their designs and decide on which one they will use for their representation for the class.

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   "Our design for card C has 1/8 yellow, 4/8 green and 3/8 red. 1/8 + 4/8 + 3/8 = 8/8 or 1 whole."
   Start with Card A and work towards Card H. Most groups will not be able to finish all 8 cards in the time allotted for the lesson.

EXPLAIN:

Bring all the students together and have them share the results of task cards A, B, and C.

Suggested questions

- What did you do for your task card?
- Do you think that this group's design fits the directions?
- How can you prove it?
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Ask students to describe how they know how many tiles of the region match up to a specific fraction.

ELABORATE:

1. Have students create their own task cards. Students should use 24 total tiles and use the denominators 2, 3, 4, 6, 8 and 12.

   Students need to make sure that the fractions add up to 24/24ths or 1 whole.

   As students work, check to make sure that they have completed the puzzle and have written fractions in simplest form.

EVALUATIONS:

1. Formative: As students are building the designs circulate around the room checking for misunderstandings. Are students using only the minimum number of tiles, can they use more?

   How did they make the decision to use the number of tiles they did, and why did they choose these colors?

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Common formative assessment pg. 637-657 of CCSS Workbook

Chapter 11 - Adding and Subtracting Fractions Essential Questions Pg. 348-349 Lesson 11.1

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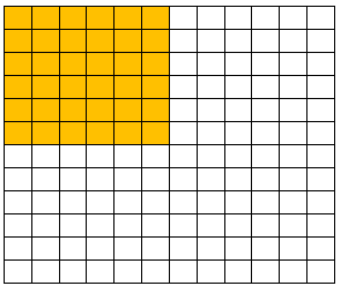
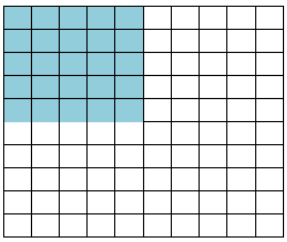
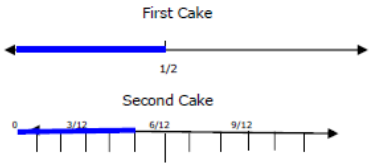


Melisa's grid



Nancy's grid



Day 1: Lesson 11.1 Estimating Fractions pg. 348 -349

Motivate : Whole Class activity
Draw the number line on the whiteboard for students to see.

_____
0 1/8 2/8 3/8 4/8 5/8 6/8 7/8 8/8

- What fraction is equivalent to ½? (4/8) 1 whole? (8/8)
- Is 1/8 closer to 0, ½, or 1? (**0**) How many steps is 1/8 from 0? (**1 step)** from ½? (**3 steps**) from 1? (7 **steps**)
- Is 5/8 closer to 0, ½, or 1? (**1/2**) How many steps is 5/8 from 0? (**5 steps**) from ½? (**1 step**) from 1? (**3 steps**)
- Is 7/8 closer to 0, ½, or 1? (**1**) How many steps is 7/8 from 0? (**7 steps**) from ½? (**3 steps**) from 1? (**1 step**)

Teach: Read about the baseball game to class. (pg.348)

- Can a baseball game ever have more than 9 innings? Explain. (yes; if there is a tie score after 9 innings.)

Building Understanding:
Materials: tracing paper, scissors

Have students work in cooperative groups to complete the task on page. 348. Have each group report on how they determined if a fraction was closer to 0, ½, or 1.

- How do you know when a fraction is close to 1? (when the numerator and the denominator are about the same)

Independent work: Have students work on # 1-14 Have students work on the first 4 problems together or as a group.

Summarize by asking students why it might be useful to know how to estimate fractions.

Day 2: Extra Practice Lesson 11.1, page H74 Do all. Correct each other and fix any errors.

Day 3: Lesson 11.2 Adding Fractions with Like Denominators pg. 350-351

Motivate: Cooperative Partners
Materials: For each pair – white paper, red crayon, blue crayon

Have pairs fold the paper into 4 equal parts and color 2/4 of the parts red and ¼ of the parts blue. Partners discuss the drawing and confer to answer the questions.

- What fraction of the paper is colored red or blue? ¾
- What is a number sentence that shows what you did? 2/4 + ¼ = ¾

Teach: Read about the game of Fizzle. Compare the fractions.

- Who scored more points? (Jamie's teammate)
- Look at the students in the photo. Describe how you think the game of Fizzle might be played. (Answers will vary)

Building understanding:
Materials: Fraction circles

Have students work in cooperative groups to complete the tasks on page 350. Have each group report on its discoveries.

- What addition sentences on page 350 is equivalent to the addition sentence 2/8 + 4/8 = _____? (2/4 + ¼ = _____) Why (**Addends are equivalent fractions**).
- Use your circle models to find 2 fractions that have a sum of 1/3 , (**1/6 + 1/6 = 2/6 = 1/3**)

Making the connections: Discuss the steps for adding fractions with like denominators. Have students complete exercises 1-3. Watch for students who add both the numerators and the denominators. Have these students refer to the fraction places.

DOK: Critical Thinking Strategy:

- How can you use mental math to add 3/5 + 1/5? (**When the denominators are the same, you can add the numerators mentally**.)

Independent work: #1-12 Have students work on the first 3 problems together. Correct and discuss the problems then work to complete the rest of the problems on their own. After completion, have students explain the sums and share their drawings for exercises 9-12.

- What did you notice about all the sums for exercises 4-8? (**Probable answer: All sums to be renamed in simplest form).**

Oral Assessments: Summarize by asking students to explain why the denominator is not added when adding fractions.

Homework or More practice Lesson 11.2, page H74 Do all and discuss each questions.

Day 4: Lesson 11.3 Subtracting fractions with like denominators Pg. 352-353

Quick Check: Before the lesson copy the following problems on the board and student answer. Give them 2 minutes to answer the problems on their notebook.

1. 1/8 + 3/8 = 4/8, or ½
2. 3/10 + 5/10 = 8/10, or 4/5
3. 2/8 + 5/8 = 7/8
4. 2/7 + 3/7 = 5/7

Motivate: cooperative partners
Materials: for each pair – paper strip, blue crayon

Have pairs fold a paper strip into 8 equal parts, color 5/8 blue, and place an X in 2/8 of the colored part.

Partners discuss the drawing and confer to answer the questions.

- How many of the colored parts do not have an X? (3 parts)
- What is a number sentence that shows what you did? (5/8 – 2/8 = 3/8)

Teach: Discuss the steps for subtracting fractions with like denominators. Have students complete exercises 1-3. Have a volunteer explain each problem at the whiteboard. Make sure students do not subtract denominators and realize that it is impossible to have zero as a denominator.

- How can you check a subtraction answer? Use addition. Example: Exercise 1: 3/5 = 1/5 = 4/5

Independent work: students after completing the ThinkPairShare with the group do the rest of the problems #4-14. Mixed Review 1-10 for extra practice or drill.

Critical Thinking Questions: How can you draw a fraction model to show 7/10 – 3/10? **Draw a model of ten tenths, and shade 7/10. Then cross out ¾, 4/10 will be the difference**. (comprehension)

Check for understanding: You may want students to check the answers with addition. However, remind students not to use the simplest-form fraction to check, because the denominators will be unlike.

Wrap up: Summarize y asking students to explain how subtracting fractions is similar to adding fractions.

Day5: Lesson 11.5 Finding common Denominator Pg. 356-357

Think Pair Share: Have students use mental math to find the sum. (board activity or group discussions)
1. 2/5 + 1/5 = 2. 6/10 + 3/10 = 3. 3/8 + 2/8 =

Teach: Read about Mike and April. Discuss fractions that have unlike denominators. Stress both denominators must be the same before adding and subtracting fractions.

Building Understanding: Have students work in cooperative groups to complete page 356. Have each group report on how it determined common denominators by trading fraction pieces.

- When finding a common denominator for 2 fractions, should you change the fraction with the smaller denominator or the one with the larger denominator? Give an example: (the smaller denominator; for ½ and 1/8, change halves – smaller denominator – to eights.

Making the connection: Discuss the examples for adding and subtracting fractions having unlike denominators. For exercises 1-2, be sure students use fraction pieces to enhance their understanding of the concept.

Check for understanding: Have students work with a partner to complete exercises 3-14. Then discuss their answers.

Wrap up: Summarize by asking students to explain why fractions must have a common denominator before they can be added or subtracted.

Extra Practice: Lesson 11.5. page H75

Day6: Adding and Subtracting with unlike denominators pg. 358 -359

Motivate: 8 index cards for each group
Write addition exercises with like and unlike denominators and subtraction exercises with like denominators on index cards.

Place the cards facedown. A student turns over a card. All students in the group find the answer. The first student to find the correct answer keeps the card. Play continues until all cards are used. Player with the most cards wins.

Teach: Discuss the warm up question. Guide students to conclude that you have to change ¼.

Read about the kickball races in Mexico. Discuss the addition of unlike fractions.

- How is subtraction of unlike fractions similar to addition of unlike fractions? (Both require changing to common denominators before adding or subtracting the numerators.

Check for understanding: After students complete exercises 1-4, have them write the number sentence on the chalkboard and explain the addition or subtraction.

- For which exercises can the difference be renamed in simplest form? (exercises 2 and 3)

Wrap up question: What denominator would you use to subtract 4/8 – 7/24? Why?

Wrap up: Summarize by discussing the wrap up question. A possible response: use 24 is a common multiple of both 8 and 24.

Day7: Adding and Subtracting Mixed Numbers pg. 362 - 363
Cooperative Groups: Motivate
Have students group review making diagrams that represent fractions such as 1/5, 3/5, ¼, ¾, and so on. Have groups continue with diagrams for mixed numbers such as 2 2/3, 5 6/12, 7 ¾, and so on. Have all students contribute to collection of diagrams.

Discuss the Warm Up question. A possible answer from students is that whole numbers are numbers like 0, 1, 2, 3, …., and fractions are numbers between whole numbers like ½, 2/3/ 5/4

Read about wade's class and the game they made with squares.

- What kind of numbers are 3 ¼ and 4 2/4? (mixed numbers)

Discuss the models.
Emphasize that addition and subtraction of mixed numbers combines addition and subtraction of whole numbers with addition and subtraction of fractions.

Check for Understanding: After students complete exercises 1-4, have volunteers explain the addition and subtraction step by step at the chalkboard.

Wrap up: Describe how to add or subtract mixed numbers.
Summarize by discussing the wrap up question. A possible response from students; first, add or subtract the fractions; then add or subtract the whole numbers.

Extra Practice: Lesson 11.7, page. H76

Assessment: Review and Maintenance pg. 360 #1-24
Objective: To maintain skills taught in this and previous chapters. Review and discuss what they have learned. Think Pair and Share

GDOE CURRICULUM MAP: Resources & Links to Technology

Adding Fractions Using Circles

Adding Fractions Using Number Lines

Another Online Fraction Strip Interactive model that can be used to show equivalence

http://www.youtube.com/watch?v=pMSZnmwbKOw

This video extends into using visuals to add with unlike denominators. You can use this to extend the learning for those students that are ready.

Mathematics Plus: Lessons 11.1; 11.2; 11.3 Pgs. 348-353 / H74- lesson 11.1/11.2 / H75 Lesson 11.3

Day5: Lesson 11.5 Finding common Denominator Pg. 356-357

Day6: Adding and Subtracting with unlike denominators pg. 358 -359
Day7: Adding and Subtracting Mixed Numbers pg. 362 - 363

Accommodations/Modifications:

1. Intervention: Students who are struggling with this activity may need help in determining the number of tiles that will be found in their design. These students may need to start with very basic designs, using the minimum number of tiles.

   Extension: If I was only able to use a certain number of tiles in my design, create task cards that a class would be able to use. Ex. I can only use 16 tiles, so create a design with 1⁄4 blue, 1/8 green, 1⁄2 red and the rest yellow.

Resources (Textbook and Supplemental):

Adding Fractions Using Circles

Adding Fractions Using Number Lines

Another Online Fraction Strip Interactive model that can be used to show equivalence

http://www.youtube.com/watch?v=pMSZnmwbKOw This video extends into using visuals to add with unlike denominators. You can use this to extend the learning for those students that are ready.

http://publish.learningfocused.com/8317634

Guam District Level Lesson Plan Quarter: 3rd

Content: Math	**Grade/Course**: 4th	**Timeline**: week 4

Standard(s):
4.MD.5.a Recognize **angles** as **geometric shapes** that are formed wherever two **rays** share a common endpoint, and understand concepts of **angle measurement**: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.

DOK 1: Classify the following angles.
What is the measurement of the shaded portion of the following angles?

Draw a 90 degrees see file

180 degrees see file

I can identify line segments, lines, and rays
I can identify angles, including acute angles, right angles, and obtuse angles.
I can recognize angles as geometric shapes.

Lesson Overview:

Summary overview:
Activities require students to make their own protractor and use it to identify and measure various angles.

Elements of the Standard(s) – What's the meaning?

In this Big Idea, the focus shifts to angles as a part of geometry. Students will develop an understanding of angles, although in a different way than perhaps previously explored.

The key lessons for students in this Big Idea are as follows:

- An angle is part of a circle (4.MD.5.a and 4.MD.5.b).
- If a circle is divided into 360 parts, then an angle that contains one of those parts (1/360) is a one-degree angle (4.MD.5a).
- The one-degree angle can be used to measure other angles (4.MD.5.b).

Lesson Objective(s):

In this lesson, students will be able to

- To identify line segments, lines, and rays
- To identify angles, including acute angles, right angles, and obtuse angles
- To recognize angles as geometric shapes

Vocabulary: Angles , protractor, angles measure Acute Obtuse Right Face Edge Vertices 2-dimensional Line segments Geometry Sides Polygon Quadrilaterals	**Focus Question(s)**: **Essential Questions** • How do we measure angles? • How do we draw angles? • How do you recognize that an angle is measured with reference to a circle with its center at the common endpoint of the rays? • How do we explain angle measure as additive? • How do we find unknown angles?

Instructional Strategies: Day 1 Introduction:

Title: ***Angles, Degrees, Protractors… Oh My!***

Materials:
Invitation to Learn

- Mystery Word
- Scissors

Using a Protractor

- *Label a Protractor*
- Overhead protractor
- Overhead projector
- Math Journal
- Glue

Classroom Protractors

- *Making My Protractor*
- Needle
- Thread
- Scissors
- *What's My Angle*

The protractor is an instrument of measurement. A protractor is used to construct and measure angles. The simple protractor is an ancient device used for plotting the position of boats on navigational charts. There are different kinds of protractors, but the one used in elementary school is called a simple protractor. We have units for measuring angles and they are called degrees. These are not the same as temperature degrees, even though the same word is used. The simple protractor looks like a semicircular disk marked with degrees, from 0o to 180o.

Angles are formed when two rays intersect. Angles are measured in degrees. A complete circle measures 360 degrees. If you take a circle and cut it into 360 slices, each of those slices is one degree. Why 360 degrees? Historians believe this is because old calendars, such as the Persian Calendar, used 360 days for a year. When they watched the stars they saw them revolve around the North Star one degree per day. This ancient measurement is still recognized today as the measurement of a circle.

To adequately use and understand using a protractor, students need to have background knowledge of the following vocabulary: angle, acute, obtuse, right, straight, reflex, vertex, and arms.

Students in 4th grade need to recognize benchmark angles:

90 degree angle= 1⁄4 of a circle

180 degree angle = 1⁄2 of a circle

270 degree angle = 3⁄4 of a circle

360 degrees = full circle

Intended Learning Outcomes:
2. Become mathematical problem solvers.
4. Communicate mathematically.

Instructional Procedures:

Group activity: Motivate - cooperative activity

Place the strip of pre-printed letters on each student's desk. The students will cut the letters apart and manipulate the letters until they figure out what the mystery word is. Instruct students when they discover the mystery word to write it down on a piece of paper and wait for teacher to verify the word.

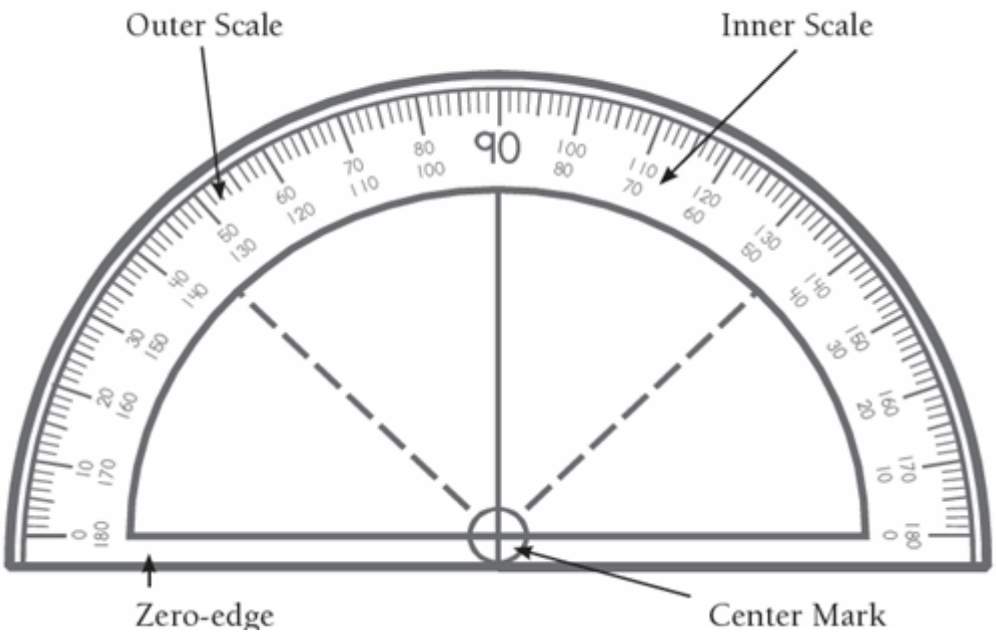
R C R P T R T O A O (Protractor)

After all students have discovered the mystery word, protractor, introduce the protractor lesson.

Instructional Procedures

Using a Protractor

1. The teacher will demonstrate how to read and label a protractor. (overhead protractor).
2. Cut out preprinted protractor. Glue in math journal.
3. The students will record how to read and label a protractor in their journal.
4. Points to label: outer scale, inner scale, center mark and zero- edge.



Cut out the protractor and place in Math Journals. Divide the page into 4 equal sections. Label the sections with the following headings. Review and discuss how to label. Record directions in journal.

Zero-Edge The zero-edge is always at the same level as the 0 mark.	Center Mark The center mark is always at the middle of the zero-edge.
Inner Scale The numbers on the inner edge of the protractor.	Outer Scale The numbers on the outer edge of the protractor.

Classroom Protractors

Fourth grade students generally find it difficult to read and calculate the degree marks accurately. A “homemade” protractor (with a dark thread) helps eliminate this problem. Manipulating the thread to lay on the exact degree, helps the students identify the exact degree on the protractor.

Constructing a Student Protractor

1. Cut out laminated protractor.
2. Thread needle and tie knot at end.
3. Bring needle up through the center mark on the protractor. Tape thread securely in place.
4. Students will manipulate the thread to line up with the angle to be measured.
5. Use the angle worksheet to practice measuring angles.

To Measure an Angle

1. Find the center mark on the straight edge of the protractor.
2. Place the hole over the vertex, or point, of the angle you wish to measure.
3. Line up the zero on the straight edge of the protractor with one of the sides of angle.
4. Find the point where the second side of angle intersects the curved edge of the protractor.
5. Place the thread on the second angle line.
6. Read the number that is written on the protractor at the point of intersection. This is the measurement of the angle in degrees.
7. There are two sets of scales on the protractor, an outer scale and inner scale. The degrees start at 0 on the straight edge, each going in opposite directions. The lines are the same so when naming angles make sure you identify which angle is being measured.

Constructing an Angle

1. Use the straight edge of the protractor to draw a straight line. This line will form one side of your angle.
2. Find the center hole on the straight edge of the protractor.
3. Place the hole over one end point of the line you have drawn.
4. Line up the zero on the straight edge of the protractor with the line.
5. Make a mark at the number on the curved edge of the protractor that corresponds to the desired measure of our angle. For example, mark at 90 for a 90 degree angle
6. Use the straight edge of the protractor to connect the mark to the end point of the first line, forming an angle.

Independent Practice

1. The protractor worksheet ***What's My Angle*** is given to each student.
2. Students will **classify** angles as acute, straight, obtuse or right.
3. Guide students in measuring various angles.
4. Record the measurements and type of angle on the worksheet.
5. Group students in pairs to check each other's work.
6. Next, on reverse side of worksheet, students will draw 3 angles to be measured by the other student.
7. Teacher will assess for accuracy.

Day 2: What's My Name Worth?

1. How much is a first name worth? Calculate the value of your name by identifying angles. Start this activity by showing the class the "angle price list."

   acute angles = 10 cents each

   obtuse angles = 8 cents each

   right angles = 5 cents each

   vertical lines = 3 cents each

   horizontal lines = 2 cents each

   diagonal lines = 1 cent each

2. Each student will use the preprinted alphabet to print his/her first name in capital letters.
3. The student then examines the name for obtuse angles, acute angles, right angles, vertical lines and horizontal lines.
4. Next the student adds the various amounts and comes up with a total.

   Example:

   J A N E

5 acute angles @ 10 cents each =	$.50
2 obtuse angles @ 8 cents each =	.16
4 right angles @ 5 cents each =	.20
4 vertical lines @ 3 cents each =	.12
4 horizontal lines @ 2 cents each =	.08
1 diagonal lines @ 1 cent each =	.01
	$1.07

Attachments

- protractor.gif

Extensions:
Curriculum Extensions/Adaptations/ Integration

- Students make angles using the Semaphore flag system.
- Students make angles any way they can without using pencil and paper, such as a "people" Clock or drawing/manipulating the hands of a clock.
- Use the price list and find the value of each letter in the alphabet.
- Use a geo-board to construct a figure.
- Use a die to determine the number of sides of a figure. Students who roll a 1 or 2 must roll again. Ten points are awarded for each angle or line the student can list about their figure.

Family Connections

- Have a family scavenger hunt for angles. A prepared list of angles could be given each family member to check off as they find them.
- Look for angles in nature.
- Explore on-line angle activities together.

Assessment Plan:

- Students draw and measure angles.
- Formal assessment requiring identifying angle type, degrees, and vocabulary.

Textbook Mathematics Plus:
Day 3: Line Segments, Lines, and Rays (Review) Pg. 286-287
Day 4: More practice Lesson 9.5, page H67
Day 5: Angles pg. 288 -289

Accommodations/Modifications:
- Instruction is differentiated according to learner needs. The goal is to help all learners meet the intent of the specified learning goal.

1. For students struggling to identify angles, provide additional pictures of real-life objects with the angles highlighted or bolded in the picture. Have these students identify the type of angle and then show the students a similar object in the classroom. Have each student run a hand along the angle in the picture and then along the angle of the real object.
2. Other accommodations would be grouping so the student has a "buddy" within the larger group.
3. Describe/rehearse rules of conduct so the child can be successful.
4. Allow each student his/her physical "space" within the group.
5. Pre-teaching vocabulary is especially important for ELL students.

Resources & Links to Technology

- Illustrative Mathematics An online resource with sample items that can be used in class or for assessment

- NCTM Illuminations Online tools that can be used by teachers and students to reinforce concepts

- Mathematics Plus pg. 286-289 (Lesson 9.5 and Lesson 9.6) Extra practice pg. H67

  http://publish.learningfocused.com/8317670

Web Sites

- Rainforest Maths
- Angles
  Interactive games
- Quia Introduction to Angles
- AmbleWeb
  Interactive protractor

Attachments

- Mystery_Word.pdf
- What_s_My_Angle.pdf
- What_s_My_Name_Worth.pdf
- Circle_Book_in_Journal_Rectangle_Book_in_Journal.pdf

Additional Resources

Books

Sir Cumference and the Great Kingdom of Angleland: A Math Adventure, by Cindy Neuschander; ISBN-10: 157091169X

Angles (Let's Investigate), by Ted Evans; ISBN-10: 1854354663

Angles are Easy as Pie, by Robert Froman & Byron Barton; ISBN-10: 069000916X

Mathematics Plus (orange book): Textbook

Formal: Chapter Review Test pp. 310-311 / Pretest, Postest pp. 274F, 290, 314, 315

Performance: Portfolio pp. 274, 285, 289, 297, 310, 312,313

- **What did I learn? (Interview/task test) pp 312**
- **What students know p. 274**
- **What students learned p. 310**

Integrated: Wrap up questions in Teacher Edition for every lesson.

Guam District Level Lesson Plan Quarter: 3rd

Content: Math	**Grade/Course**: 4th	**Timeline**: week 5

Standard(s):

4.MD.5.b Recognize **angles** as geometric shapes that are formed wherever two **rays** share a common endpoint, and understand concepts of angle measurement: b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

I can recognize angles as geometric shapes.

I can recognize that an angle is part of a circle.

I can recognize one-degree angle that can be used to measure other angles.

Lesson Overview:

Elements of the Standard(s) – What's the meaning?

In this Big Idea, the focus shifts to angles as a part of geometry. Students will develop an understanding of angles, although in a different way than perhaps previously explored.

The key lessons for students in this Big Idea are as follows:

- ☐ An angle is part of a circle (4.MD.5.a and 4.MD.5.b).
- ☐ If a circle is divided into 360 parts, then an angle that contains one of those parts (1/360) is a one-degree angle (4.MD.5a).
- ☐ The one-degree angle can be used to measure other angles (4.MD.5.b).

Lesson Objective(s):

In this lesson, students will be able to

- recognize angles as geometric shapes that are formed wherever two rays share a common endpoint.
- Understand concepts of angle measurement.
- L9.5 To identify line segments, line, and rays.
- L9.6 To identify angles, including acute angles, right angles, and obtuse angles

Vocabulary: Angles
Acute
Obtuse
Right
Face
Edge
Vertices
2-dimensional
Line segments
Geometry
Sides
Polygon
Quadrilaterals
Angle measure
Protractor

Focus Question(s): **Essential Questions**

- How do we measure angles?
- How do we draw angles?
- How do you recognize that an angle is measured with reference to a circle with its center at the common endpoint of the rays?
- How do we explain angle measure as additive?
- How do we find unknown angles?

INSTRUCTIONAL STRATEGIES:

Online Instructional videos samples of activities for students:

https://learnzillion.com/resources/72982-understand-angles-angle-measurement-and-degrees-4-md-c-5a-4-md-c-5b

Main Curriculum Tie:
Mathematics - 4th Grade
Standard 3 Objective 1
Identify and describe attributes of two-dimensional geometric shapes.

Materials:

- 2 balls of yarn
- A-Z cards
- 12 angle cards
- Rulers
- Overhead projector
- Angle rulers
- Protractors
- Pattern blocks
- 360-degree Circle
- Whiteboards
- Dry erase markers
- 4" Angle manipulative
- Large angle manipulative
- Angle Assessment
- Crayons
- White art paper

Prior knowledge needed to complete this activity: Be able to identify parallel, intersecting, and perpendicular lines. By the end of this activity students should be able to identify:

Right angle: A 90-degree angle
Acute angle: An angle that is less than 90 degrees
Obtuse angle: An angle that is greater than 90 degrees
Know that angles are measured in degrees and develop benchmark angles (e.g. 45 degrees, 60 degrees, 120 degrees) and be able to measure angles using protractors or angle rulers.

Intended Learning Outcomes:
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

By the end of this activity students should be able to identify three types of angles, know that angles are measured in degrees, and be able to measure angles using protractors or angle rulers.

Day 1: Continue with Exploring Angles: Lesson 9.6 pg. 288-289
Worksheets – Reteach L.9.6 Exploring Angles

Motivate: Cooperative Groups

Student 1 will draw a ray and label it ray. ST _____>

Student 2 will draw another ray on the figure that shares the same endpoint.

Partners will confer to answer the question.

- What Figure is formed? **An Angle**

Have students share their drawings and discuss how they are alike and how they are different – in particular, differences in amounts of the opening between rays.

Teach: Read about angles. Point out that the letter of the vertex of the angle is always the middle letter when naming an angle.

Have students work in cooperative groups to complete the tasks on page. 288. Have each group report on how they formed right, acute, and obtuse angles. Conclude the discussions with the following questions. Students may also use various forms to display their understanding of the angles.

- Suppose 3 rays have the same vertex. How many different angles are formed? **3 angles**
- Can a right angle and an acute angle be formed from rays with the same vertex? **Yes** an obtuse and an acute angle? **Yes** an obtuse and a right angle? **yes**

Think Pair and Share before Independent work: Discuss the type of angles illustrated for Exercises 1-5

- For exercises 5, how many slices of pizza form a right angle? **2 slices** on obtuse angle? **3 slices**
- What angle is easy to find in buildings? **Right angle – corners of rooms, doors, windows, and so on…**

You may want to make a bulletin-board display of the pictures students draw for Exercises 6-8

Independent work: Students may work alone or with a partner to complete numbers 9 – 23 Also

students may find the measurement to reinforce the use of protractor.

Summarize by asking students whether all polygons have angles. Guide students to conclude that they do.

Summative assessment:

- Two rays with a common endpoint form an? _____ **angle**
- A square corner forms a _____ angle. **Right**
- The common endpoint of an angle is called a _____ **vertex**
- An _____ angle is greater than a right angle. **Obtuse**
- An _____ angle is less than a right angle. **Acute**

Day 2: Extra Practice Lesson 9.6 page H67 Do extra practice and have students work in pairs to find the angles. Students also can find the measurement by using protractors. Textbook - Mathematics Plus

Day 3: Line Segments, Lines, and Rays pg. 286 -287 Lesson. 9.5

Materials: toothpicks

Discuss the wrap up question. Possible answers are: a line or a part of a line.
Wrap up question: How are line segments, lines and rays the same? How are they different?

Read together with the class about Flat Matt's model. Pg. 286 Discuss with the groups.

- Talk about how many line segments are in a square. **4 line segments**
- What do you call the point where two line segments meet? **vertex**
- Can a toothpick be used to make a model of a line? **Why or why not? No; a line has no end points, a toothpick does.**
- Name a polygon that can be made with eight toothpicks. Octagon

Have students give examples of things in everyday life that suggest a line, line segments, or ray.
Possible answers: sun – ray; horizon – line; string on balloon – line segment

Think Pair Share Activity: Have students work on exercises #1-4, explain why they chose line, ray or line segment.

- What is the relationship of line segments to a polygon? **The sides of a polygon are line segments.**

Summarize by discussing the Wrap Up question. Possible responses from students: line segments have 2 endpoints and are parts of line; line go on in both directions; rays have 1 endpoint and go on in 1 direction.

Assessment: Have students write true or false.

1. A line segment begins and ends with points. **TRUE**
2. A line never ends. **TRUE**
3. A line is a part of a line segment. **FALSE**

DAY 4-5: Instructional Procedures: Different activities that can be used with lesson
Cooperative group activity

Divide class into two groups. Have them stand arm length apart in a circle. Give each group a ball of yarn. Instruct them to pass the yarn to make a web. They may not pass the yarn to the person next to them; encourage them to pass across the circle as much as possible. Each child needs to hold onto the yarn and not let go. When they are all holding onto the yarn have them carefully lay their web down on the ground, stretching it slightly so the yarn is in straight lines.

Review parallel, intersecting, and perpendicular lines by finding them within the web. Have students identify the places where the lines intersect and mark them with points. Explain that when two lines meet together at one point we call that the VERTEX and that the lines, which are called rays, extending from the vertex form an ANGLE. Now look at the web to see if you can identify angles. Review how lines are named by points. Explain that angles are named using three points, with the vertex point always in the middle (ABC) and that we use this symbol < for angle. (

Instructional Procedure

1. Classifying Angles (Right, acute, obtuse)

   Before the lesson prepare 12 angle cards. Use cardstock and draw one angle on each card–make 4 right angles, 4 acute angles, and 4 obtuse angles. Label the points and write the angle name.

   Place the angle cards on the board. Ask the class to carefully examine them and see if they can classify them into three groups. Have students come to board and move the angle cards into three groups. Continue working until students have correctly grouped them into right, acute, and obtuse angles. Write the name of each type of angle above the cards. Have class practice reading the names and identify the characteristics of each.

2. Identifying Angles

   Put students into small groups or partners. Give each group a set of pattern blocks.

   Tell them they need to look at each type of pattern block and identify the types of angles on each. Give each student a piece of art paper. Have them divide it into three sections labeled: Right Angle, Obtuse Angle, and Acute Angle. Have them trace the angles of the pattern blocks into the correct section.

3. Identifying Benchmark Angles using fraction circles

   Give each student a copy of the 360-degree Circle worksheet, which has been copied on cardstock.

Discuss how a circle has 360 degrees. Link it to skateboard and snowboard tricks like the 180 and the 360. As you discuss each one have the students find it on their 360-degree Circle worksheet.

If you divide a circle in half how many degrees to you have? 180. Have them jump and spin and try to land at 180 degrees. Now start at 0 degrees on your circle and trace your finger around to 180 degrees. What about a half of the half? That would be 90 degrees. Jump 90 degrees at a time and see if they can figure out the degrees–link it to the 9 times tables. So if you could jump all the way around you would be doing a 360!

Have students put away their 360 degrees Circle paper so they cannot see it during the following activity. Give each student a piece of 9 x 12 art paper. Put students into partners and give each group a set of fraction circles cut out of foam board. You need to have a whole, halves, fourths, eighths, sixths, and thirds.

Have students fold their art paper to make four boxes. Have them trace their whole circle in each of the boxes on the front and in two boxes on the back. (Total of 6 boxes)

Work with students to identify the benchmark angles.

Begin with the whole circle. Review how many degrees are in a complete circle. Write: "A whole circle has 360 degrees". Ask how much of the circle 180 degrees would be. Have them find the fraction pieces that would cover half the circle. In the second box have the students trace the halves onto the circle, write 180 degrees on the circle in the correct place, trace the 180-degree angle in crayon and shade it in. Above the circle write "180 degrees is half the circle." (You can also teach your students that this is called a straight angle)

Note: As you do these fraction pieces make sure they lay the first fraction piece so its baseline is on the 0 degree line of the circle, this will form the angle correctly.

Continue with 90 degrees. Remind them how far they had to jump. How could you relate 90 degrees to a fraction of your circle? Lay your fraction pieces on your circle and see which ones correspond to 90 degrees on the circle. Find the fractions that would make 90-degree angles. Trace the fourths, highlight the first one-fourth, and label 90 degrees on the circle and then above the circle write "90 degrees is 1/4 of the circle". As you work through the rest of these angles have the students compare them to the 90-degree angle to give them a reference point.

Repeat for 45 degrees, 60 degrees, and 120 degrees.

4. Make an angle manipulative. Give each student two 1" x 6" strips of oaktag and a fastener.

   Draw a ray on each strip. Mark an endpoint on each ray, then put the strips together to form a vertex and put the fastener through them. Make a larger version for you to use to demonstrate on the board. Have them look at their fraction circle papers and try to reproduce the angles using

their angle manipulatives.

5. Formative Assessment: Have students use whiteboards or white art paper and crayons. Example: Draw two angles, one 90 degrees and one 45 degrees, on the board or overhead. Instruct students to copy the 90-degree angle. Have them hold up their white boards or papers to check. Continue with other angle comparisons; include right, acute, and obtuse angles also.
6. Measuring Angles using an angle ruler or protractor

   Show students an angle ruler and a protractor; explain that these are the tools we use for measuring angles. Demonstrate how they work. Put students into partners and let them experiment with the tools. Draw different angles on the overhead and measure them. Have students draw and measure them with you. Have students use their angle manipulative. Have them work in partners. One student will make an angle using their manipulative; the other student will use the angle ruler or the protractor to measure the angle.

7. Play "What's Your Angle?"

   Draw angles on the board or overhead. Have students estimate and write down the angle's degrees. Then have students come up and measure. If their estimate is exactly correct they get 10 points. Deduct one point for every degree they are off—if they are one degree off they will get 9 points, continuing down to 9 degrees off they will get 1 point, 10 or more degrees off they will get 0 points. Variation: Play STOP! Use a large angle manipulative on the board. Tape the bottom ray so that it stays at 0 degrees. Identify the degree of angle you want to make. Choose a student to come to the front. Their job is to yell, "STOP" when they think you have made that degree of angle. They can solicit help from the other students. Move the other ray slowly (remember that angles are measured going counterclockwise) The student yells stop when they think you have reached the correct degree. Tape the ray down and measure the angle. Choose your "winner" criteria before starting. Example: They have to be within 5 degrees to win. If they win give them a small treat.

Family Connections

- Have students enlist the help of their families to go on an "Angle Hunt" at their homes. Have them find and describe at least one example of each type of angle.

Assessment Plan:
Use the *Angle Assessment* blackline as a final assessment.

Accommodations/Modifications:

Extensions:

- Struggling learners can be paired with more advanced learners
- Angle Tangle: Assign students to draw 5-7 straight lines with several intersections. Then connect the endpoints of the lines. Mark the angles created within in the design and color code them by right, acute, and obtuse angles. Color the rest of the design.
- String Art: Do a line design but give students string, oaktag, and safe plastic needles. Have them make the design using the string.
- Use AngLegs sets which include connecting pieces to form angles and a protractor that attaches to the pieces for independent practice in measuring angles.
- Integrating Technology: Take a digital camera and take your class on an "Angle Hunt". Have them identify angles in architecture, machines, nature, etc. Take photographs of the students and the angles. Use them to make a Power Point presentation.

Resources & Links to Technology

Additional Resources

Media

- Find-the-Angle Pro Ruler: Item #FA-779 Lakeshore Elementary 2007-08 1-800-778-4456 http://www.lakeshorelearning.com
- AngLegs Item #DG205057TS Summit Learning 1-800-777-8817 summitlearning.com
- Basic Geometry Blackboard Topper. This is a chart to display in your room for a quick review of line concepts. (It includes lines, angles, polygons, and solid shapes) Summit Learning 1-800-777-8817 or online at www.summitlearning.com. Item Number DG20368ITS

Attachments

- 360_circle.pdf
- angle_assessment.pdf

Web Sites

- Math Open Reference

This website features explanations and examples of each type of line, plus an interactive features which allows students to manipulate lines to make lines, line segments, perpendicular, parallel, and intersecting lines.

- Ambleweb
  This is a website published by an elementary school. It was many interactive activities dealing with geometry. Try the one on measuring angles.

- Illustrative Mathematics An online resource with sample items that can be used in class or for assessment

- NCTM Illuminations Online tools that can be used by teachers and students to reinforce concepts

Mathematics Plus Textbook:
Lesson 9.5 Line Segments, Lines, and Rays
Extra Practice: Lesson 9.5 pg. H67
Worksheets – cooperative work

Lesson 9.6 Exploring Angles pg. 288 -289
Extra practice: Lesson 9.6 pg. H67
Worksheets – cooperative work

Guam District Level Lesson Plan Quarter: 3rd

Content: Math	**Grade/Course**: 4th	**Timeline**: week 6

Standard(s):
4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

I CAN MEASURE ANGLES IN WHOLE NUMBER DEGREES USING A PROTRACTOR.
I CAN SKETCH ANGLES OF SPECIFIED MEASURE.

Lesson Overview:
Big Idea 2: Students will understand that geometric figures can be analyzed and classified based on their properties, such as having parallel lines, particular angle measures, and symmetry.

What are the variety of situations that angles can be presented?

Prior Knowledge before lesson:
Students should have experiences with the following prior to this lesson.

- Types of angles: acute, obtuse, right, straight angles
- Understanding that two rays that share an endpoint (vertex) form an angle
- Sorting quadrilaterals by types of angles

Note: Prior to the lesson, consider having struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.

Lesson Objective(s):
In this lesson, students will be able to
The student will:

- Explain that an angle is made by two rays with a common endpoint (vertex).
- Use a protractor to measure angles which are presented in a variety of orientations to the nearest degree.
- Sketch angles of various specified measures.

The student will understand:

- There are 360° in a full circle.
- A 1° angle that turns 90 times through the circle is a 90° angle and so on.
- Angles are measured in degrees.
- Benchmark angles of 180°, 90° and 45° are helpful when classifying and measuring angles.

Vocabulary: **Vocabulary**:
Angles
Acute
Obtuse
Right
Face
Edge
Vertices
Line segments
Geometry
Sides
Polygon

Focus Question(s): **Essential Questions**

- How do we measure angles?
- How do we draw angles?
- How do you recognize that an angle is measured with reference to a circle with its center at the common endpoint of the rays?
- How do we explain angle measure as additive?
- How do we find unknown angles?

INSTRUCTIONAL STRATEGIES:

ONLINE INTRODUCTION REVIEW/ IDEAS: http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Relevance/ Connection:

- Clocks are circles and the hands form different types of angles as they move around the clock face
- In various sports, athletes often refer to "doing a 360, a 180," etc. and they are referring to the amount of turns around a circle they are completing.

MOTIVATION:

Materials Needed

One of these video clips:

- Kobe Bryant 360 degree dunk

  http://www.youtube.com/watch?v=jfD8aWe1QdA

- Vince Carter 360 degree dunk

  http://www.youtube.com/watch?v=4rLL_g3GZtg

- Vince Carter 180 degree dunk

  http://www.youtube.com/watch?v=7mG4MmddLos

Directions:

1. Have students brainstorm in pairs or trios: When have you heard 360, 180, 90 degrees? (Example: Doing a 360 or a 180 in sports such as basketball or ice skating)
2. Optional: After students have had a few minutes to brainstorm, view one of the video clips listed below:
   - Kobe Bryant 360 degree dunk

     http://www.youtube.com/watch?v=jfD8aWe1QdA

   - Vince Carter 360 degree dunk

     http://www.youtube.com/watch?v=4rLL_g3GZtg

   - Vince Carter 180 degree dunk

     http://www.youtube.com/watch?v=7mG4MmddLos

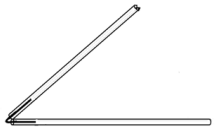
Materials Needed:

- Straws (two or each student)
- 3-inch pieces of pip cleaner (one for each student)

Part 1

Each student makes an "angle explorer"

- Give each student 2 straws and a length of pipe cleaner approximately 3 inches long.
- Students bend the pipe cleaner in half and insert each end into the straws.



Part 2

- Have students show different types of angles with their angle explorer (acute, obtuse, right, straight)
- Discuss: Angles are formed by two rays sharing an endpoint like two clock hands. Have students identify the vertex and the two rays on their angle explorer.
- Have students work in pairs.
- Give students different times such as 1:15, 12:30, 2:35. Students should move the clock hands to the given times and match with angle explorer. Have them identify the types of angles formed with their partner.

Day 2: How is a circle measured?

Materials Needed:

- Resource Sheet 4: Paper Circle (one circle for each student)

Directions:

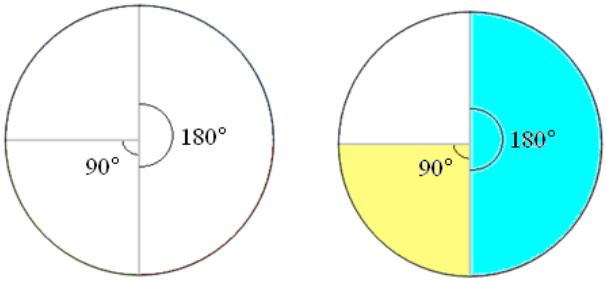
- Ask students if they know how a circle is measured. Refer back to the Motivation Activity.
- Discuss that a full circle is 360° and that circles and angles are measured in degrees. The angle measurement is measuring the spread of the rays in a circle. Introduce the degree symbol. Relate to clocks and the movement of the clock hands.
- Give each student a paper circle with the center point marked from Resource Sheet 4: Paper Circle.
- Have students fold the circle in half and then trace over the line. Encourage them to be as exact as possible.
- Ask: If a circle equal 360°, what would ½ circle equal?
- Label half circle 180. (See example.)

- Have students fold circle in ½ again, creating four sections and trace over the line.

Ask: Think Pair Share (students discuss amongst each other)

- How many sections do you have now? (4)
- What fraction of the circle would one section be? (1/4)
- Remember that half of a circle is 180° so how many degrees would ¼ of a circle be? (90°)
- What fraction of the circle is 90° (1/4)

- A full circle is 360°. Is 90° ¼ of 360°?
- Have students label 90° on their circle.



Note: Students who have difficulty visualizing the parts of a circle could color the angles as shown above.

- Have students use their angle explorer from Activity 1 to form 90° angle and a 180° angle and lay on top of the lines on their circle to model the two types of angles.

Day 3: Making and Using a Wax Paper Protractor

1. Pass out square of wax paper and Resource Sheet 5: Angle Worksheet (which displays 3 circles – ¼, $^1/_8$, $^1/_{16}$).
2. Using the beginning directions on Resource Sheet 6: Making a Wax Paper Protractor, ask students to fold the wax paper in half and then in half again.
3. Once students have folded the wax paper twice, making fourths, have students lay their "protractor" on the paper circle showing fourths on Resource Sheet 5: Angle Worksheet.
4. Model how to line the vertex up and rotate it around the circle 4 times to complete the circle.
5. Have students verbalize that it is fourths because there are four sections and the protractor needs to be rotated 4 times to cover the four sections.
6. Have students fold the wax paper again and repeat step 3 for eighths, as stated on Resource Sheet 6.
7. Have students fold the wax paper again and repeat step 3 for sixteenths.
8. Discuss: Could students continue to fold the wax paper, making smaller and smaller "wedges"? (Theoretically, yes. They can't with the wax paper because the wedges become too small to fold anymore.)

9. Ask:
    - How many "wedges" in a full circle? (360)
    - How do you know? (360° in a circle)
    - What is the measure of each of these wedges? (1°)

Day 4: Closure

Materials Needed:

- Resource Sheet 7: Exit Ticket

Wrap Up:

1) Distribute Resource Sheet 7: Exit Ticket and allow time for students to complete it.
2) Collect the Exit Ticket from each student and ask them to join you up front for a class discussion.
3) Discussion: Refer back to the motivation.
   - Talk about why something is called a 180, a 360, etc?
   - What would two complete turns be called?
   - Show clip of Shaun White doing a 1260.
     http://www.youtube.com/watch?v=qIr2ki4nWkU
     http://www.youtube.com/watch?v=oF-jmHTYLBQ

Ask student how many turns is a 1260? Prove your answer

Interventions/ Enrichments:

Special Education/Struggling Learners and ELL students:

- Prior to the lesson, consider having struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.
- Students who have difficulty visualizing the parts of a circle could color the angles as shown in Activity 2

ELL students

- Provide a vocabulary sheet identifying and illustrating the different types of angles (acute, obtuse, right, straight)

Gifted and Talented

- Babylonians – share what they learn

Challenge problems are included on the exit slip for enrichment purposes

- Resource Sheet 1: Background Information for the Teacher (Read prior to lesson.)
- Resource Sheet 2: Pretest
- Resource Sheet 3: Pretest Answer Key
- Judy clocks (one per student and teacher)
- One of these video clips:
- Kobe Bryant 360 degree dunk
  - http://www.youtube.com/watch?v=jfD8aWe1QdA
- Vince Carter 360 degree dunk
  - http://www.youtube.com/watch?v=4rLL_g3GZtg

- Vince Carter 180 degree dunk
    - http://www.youtube.com/watch?v=7mG4MmddLos
- Straws – 2 per student
- 3-inch length of pipe cleaner – 1 per student
- Resource Sheet 4: Paper Circle (one circle for each student)

- Wax Paper Squares (one for each student)
- Resource Sheet 5: Angle Worksheet
- Resource Sheet 6: Making a Wax Paper Protractor (one for the teacher)
- Resource Sheet 7: Exit Ticket

Summary:
By the end of this activity students should be able to identify three types of angles, know that angles are measured in degrees, and be able to measure angles using protractors or angle rulers.

Prior knowledge needed to complete this activity: Be able to identify parallel, intersecting, and perpendicular lines. By the end of this activity students should be able to identify:

REVIEW:
Right angle: A 90-degree angle
Acute angle: An angle that is less than 90 degrees
Obtuse angle: An angle that is greater than 90 degrees
Know that angles are measured in degrees and develop benchmark angles (e.g. 45 degrees, 60 degrees, 120 degrees) and be able to measure angles using protractors or angle rulers.

Extended Activities to do with your class:

Intended Learning Outcomes:
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

Instructional Procedures:
Invitation to Learn

Divide class into two groups. Have them stand arm length apart in a circle. Give each group a ball of yarn. Instruct them to pass the yarn to make a web. They may not pass the yarn to the person next to them; encourage them to pass across the circle as much as possible. Each child needs to hold onto the yarn and not let go. When they are all holding onto the yarn have them carefully lay their web down on the ground, stretching it slightly so the yarn is in straight lines.

Review parallel, intersecting, and perpendicular lines by finding them within the web. Have students identify the places where the lines intersect and mark them with points. Explain that when two lines meet together at one point we call that the VERTEX and that the lines, which are called rays, extending from the vertex form an ANGLE. Now look at the web to see if you can identify angles. Review how lines are named by points. Explain that angles are named using three points, with the vertex point always in the middle (ABC) and that we use this symbol < for angle. (

Instructional Procedure

1. **Classifying Angles** (Right, acute, obtuse) Before the lesson prepare 12 angle cards. Use cardstock and draw one angle on each card–make 4 right angles, 4 acute angles, and 4 obtuse angles. Label the points and write the angle name.

   Place the angle cards on the board. Ask the class to carefully examine them and see if they can classify them into three groups. Have students come to board and move the angle cards into three groups. Continue working until students have correctly grouped them into right, acute, and obtuse angles. Write the name of each type of angle above the cards. Have class practice reading the names and identify the characteristics of each.

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Put students into small groups or partners. Give each group a set of pattern blocks.

Tell them they need to look at each type of pattern block and identify the types of angles on each. Give each student a piece of art paper. Have them divide it into three sections labeled: Right Angle, Obtuse Angle, and Acute Angle. Have them trace the angles of the pattern blocks into the correct section.

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Give each student a copy of the 360-degree Circle worksheet, which has been copied on cardstock.

Discuss how a circle has 360 degrees. Link it to skateboard and snowboard tricks like the 180 and the 360. As you discuss each one have the students find it on their 360-degree Circle worksheet.

If you divide a circle in half how many degrees to you have? 180. Have them jump and spin and try to land at 180 degrees. Now start at 0 degrees on your circle and trace your finger around to 180 degrees. What about a half of the half? That would be 90 degrees. Jump 90 degrees at a time and see if they can figure out the degrees–link it to the 9 times tables. So if you could jump all the way around you would be doing a 360!

Have students put away their 360 degrees Circle paper so they cannot see it during the following activity. Give each student a piece of 9 x 12 art paper. Put students into partners and give each group a set of fraction circles cut out of foam board. You need to have a whole, halves, fourths, eighths, sixths, and thirds.

Have students fold their art paper to make four boxes. Have them trace their whole circle in each of the boxes on the front and in two boxes on the back. (Total of 6 boxes)

Work with students to identify the benchmark angles.

Begin with the whole circle. Review how many degrees are in a complete circle. Write: “A whole circle has 360 degrees”. Ask how much of the circle 180 degrees would be. Have them find the fraction pieces that would cover half the circle. In the second box have the students trace the halves onto the circle, write 180 degrees on the circle in the correct place, trace the 180-degree angle in crayon and shade it in. Above the circle write “180 degrees is half the circle.” (You can also teach your students that this is called a straight angle)

Note: As you do these fraction pieces make sure they lay the first fraction piece so its baseline is on the 0 degree line of the circle, this will form the angle correctly.

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Continue with 90 degrees. Remind them how far they had to jump. How could you relate 90 degrees to a fraction of your circle? Lay your fraction pieces on your circle and see which ones correspond to 90 degrees on the circle. Find the fractions that would make 90-degree angles. Trace the fourths, highlight the first one-fourth, and label 90 degrees on the circle and then above the circle write "90 degrees is 1/4 of the circle". As you work through the rest of these angles have the students compare them to the 90-degree angle to give them a reference point.

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   Show students an angle ruler and a protractor; explain that these are the tools we use for measuring angles. Demonstrate how they work. Put students into partners and let them experiment with the tools. Draw different angles on the overhead and measure them. Have students draw and measure them with you. Have students use their angle manipulative. Have them work in partners. One student will make an angle using their manipulative; the other student will use the angle ruler or the protractor to measure the angle.

4. **Play "What's Your Angle?"**

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points. Deduct one point for every degree they are off—if they are one degree off they will get 9 points, continuing down to 9 degrees off they will get 1 point, 10 or more degrees off they will get 0 points. Variation: Play STOP! Use a large angle manipulative on the board. Tape the bottom ray so that it stays at 0 degrees. Identify the degree of angle you want to make. Choose a student to come to the front. Their job is to yell, "STOP" when they think you have made that degree of angle. They can solicit help from the other students. Move the other ray slowly (remember that angles are measured going counterclockwise) The student yells stop when they think you have reached the correct degree. Tape the ray down and measure the angle. Choose your "winner" criteria before starting. Example: They have to be within 5 degrees to win. If they win give them a small treat.

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Resources (Textbook and Supplemental):

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http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Spectrum Workbook: pages 116, 117,

Technology:

Links for Motivation Activity:

- Kobe Bryant 360 degree dunk http://www.youtube.com/watch?v=jfD8aWe1QdA
- Vince Carter 360 degree dunk http://www.youtube.com/watch?v=4rLL_g3GZtg
- Vince Carter 180 degree dunk http://www.youtube.com/watch?v=7mG4MmddLos

Online Resources:

Measuring Angles with a Protractor:
www.mathplayground.com/measuringangles.html
Practice reading a protractor. The protractor is already lined up with the vertex of each angle, but the protractor needs to be rotated into the proper position. The angle measure is reported in whole numbers and the margin of error is only 1°.

Alien Angles game:
www.mathplayground.com/alienangles.html
Alien Angles game: Practice estimating angles with this game. It is challenging and some students might find it frustrating.

Creating Practice Worksheets:
www.worksheetworks.com/math/geometry/measuring-angles.html
This site allows the teacher to create a practice worksheet that provides students with a set of angles that they measure with a protractor. Teachers are able to specify the range of angles used on the worksheet and are able to make the measuring easier by not rotating the angle, which will keep the base of the angle always horizontal on the worksheet.

Resource Sheet 1 **Background information for the teacher**

Mesopotamia Mathematics and the 360-Degree Circle

■ The Mesopotamians are credited with inventing mathematics. The Mesopotamians numerical system was based on multiples of 6 and 10. The first round of numbers were based on ten like ours, but the next round was based on multiples of six to get 60 and 600. Why it was based on multiples of six, no one knows. Perhaps it is because the number 60 can be divided by many numbers: 2, 3, 4, 5, 6, 12, 15, 20 and 30.

■ The Sumerians developed a numerical system based on 60. The base 6 numerical system is the reason why Babylonians chose 12 months instead of 10 for their calendar and why hours and minutes are divided into 60 units and why we have dozens and a circle has 360 degrees. Babylonian astronomers knew the true number of days in a year, but kept it at 360 because that number was believed to be possessed with magical properties.

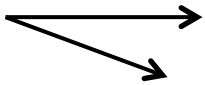
■ Babylonians devised the system of dividing a circle into 360 degrees (some say it was the Assyrians who first divided the circle). The tiny circle as a sign for a degree was probably originally a hieroglyph for the sun from ancient Egypt. A circle was used by the ancient Babylonian and Egyptian astronomers to the circle the zodiac. The degree was a way of dividing a circle and designating the distance traveled by the sun each day. It is no coincidence then that the number of degrees in a circle (360) corresponds with the days of the year on the Babylonian calendar.

Source:
http://factsanddetails.com/world.php?itemid=1511&catid=56&subcatid=363

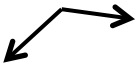
Resource Sheet 2: **Pretest**

Name _____ Date _____

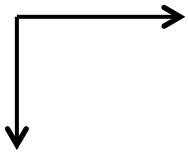
Directions: Name the types of angles shown below.



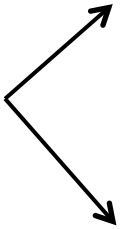
1._____



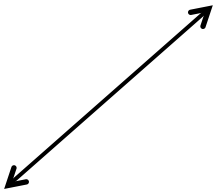
2._____



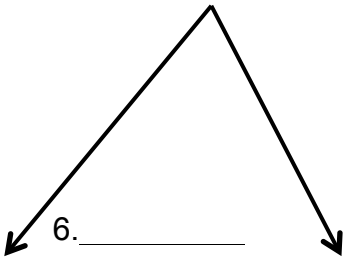
3._____



4._____

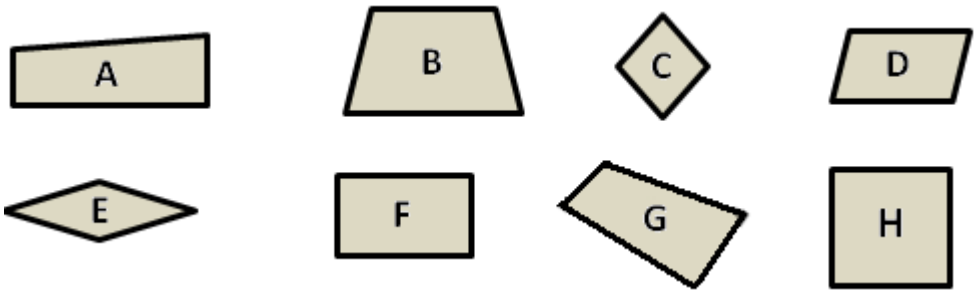


5._____



6._____

Directions: Answer questions 7-12 by listing the letters of the appropriate quadrilaterals.



7. Which quadrilaterals have only right angles? _____

8. Which quadrilaterals have at least one acute angle? _____

9. Which quadrilaterals have at least one obtuse angle? _____

10. Which quadrilaterals have at least one right angle? _____

11. Which quadrilaterals have at least one acute, one obtuse and one right angle? _____

12. Which quadrilaterals have acute and obtuse angles? _____

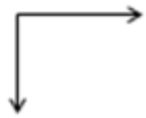
Resource Sheet 3:

Pretest - ANSWER KEY

Name the types of angles shown below.

1. acute

2. obtuse



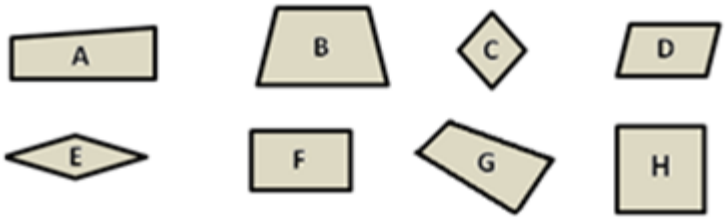
3. right

4. right

5. straight

6. acute

Sorting Quadrilsterals



7. Which quadrilateral(s have only right angles? F, H
8. Which quadrilaterals have at least one acute angle? A, B, C, D, E, G
9. Which quadrilaterals have at least one obtuse angle? A, B, C, D, E, G
10. Which quadrilaterals have at least one right angle? A, F, G, H
11. Which quadrilaterals have acute, obtuse and right angles? A, G
12. Which quadrilaterals have acute and obtuse angles? A, B, C, D, E, G

Teacher Note/Look fors:

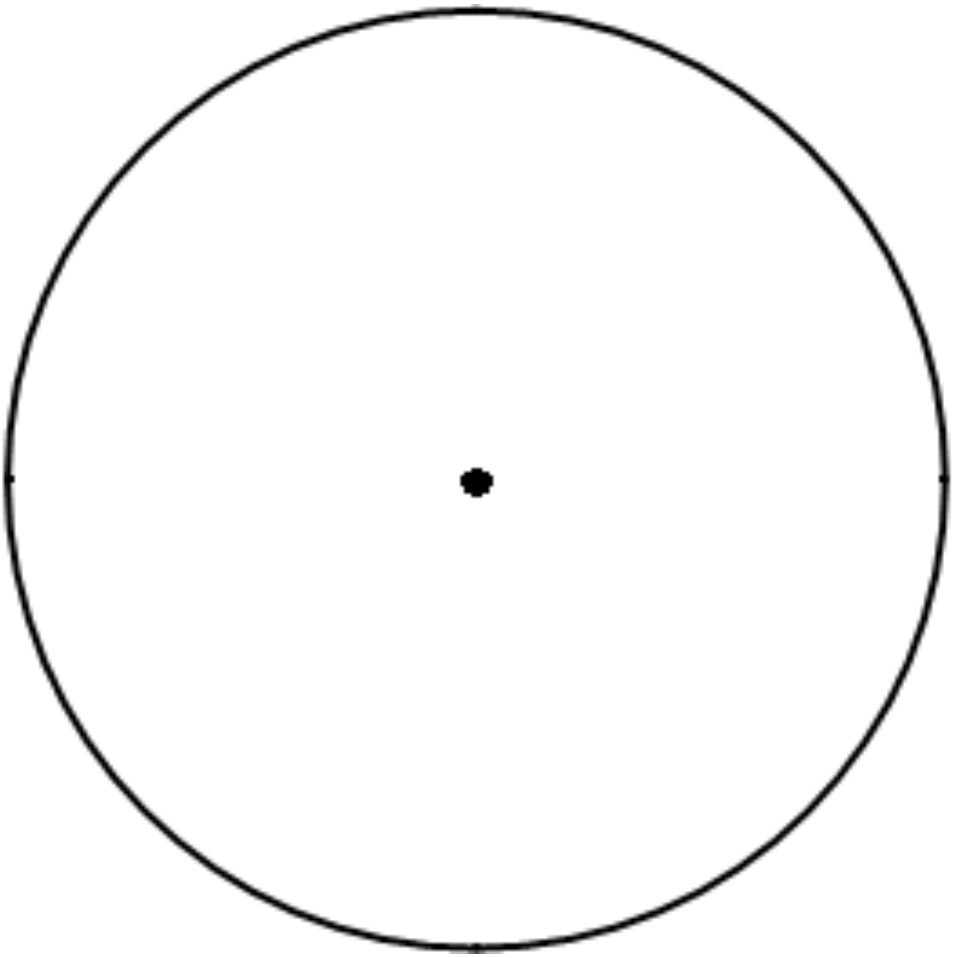
- **Did students generally know the different types of angles?**
- **If students thought #2 is an acute angle and #6 is an obtuse angle, they might have a misconception that the length of the rays determine what type of angle it is.**
- **Did students recognize #4 is a right angle and quadrilateral G has a right angle? (Right angles that are oriented differently than what they are used to.) If so, these students might need more work**

focusing on attributes of polygons regardless of orientation, i.e., tracing square pattern blocks with different orientations, etc.

- **Did students see the connection between their answers in 7-12? For example, any quadrilateral with an acute angle must also have an obtuse angle. The only quadrilaterals without acute and obtuse angles are those with all right angles.**

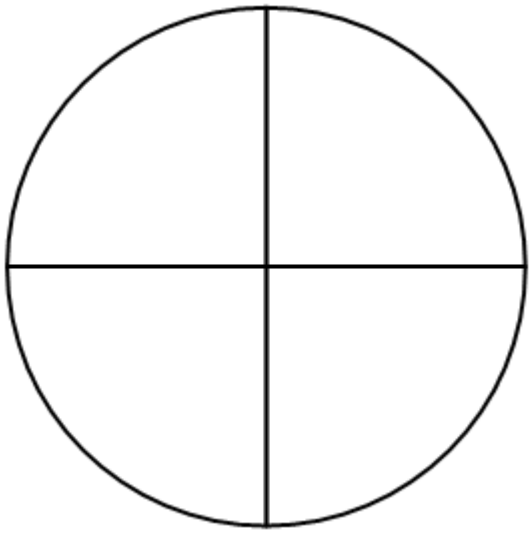
Resource Sheet 4:

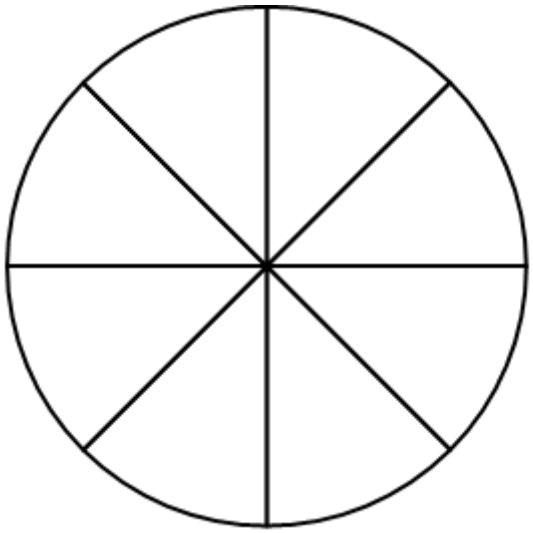
Paper Circle

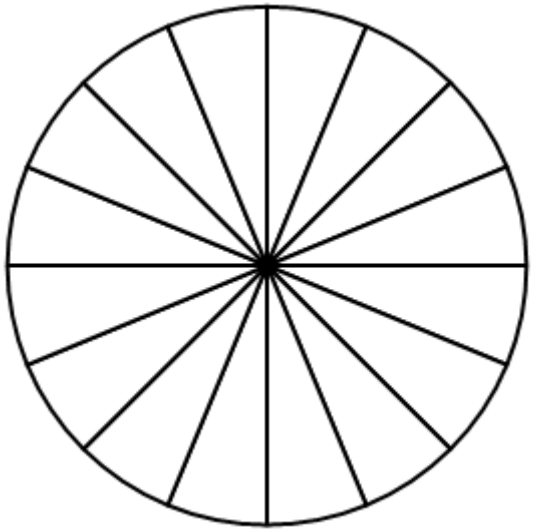


Resource Sheet 5

ANGLE WORKSHEET



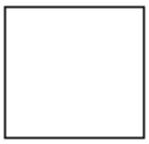




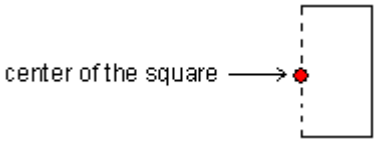
Resource Sheet 6

MAKING A WAX PAPER PROTRACTOR

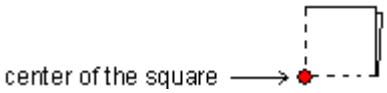
1. Start with a square sheet of paper, approximately 4 inches x 4 inches.



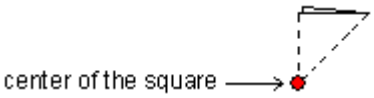
2. Fold the square in half, creating a rectangle. Crease the fc



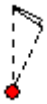
3. Fold the rectangle in half, creating a new square. Crease the fold.



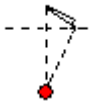
4. Fold the new square in half like a triangle.



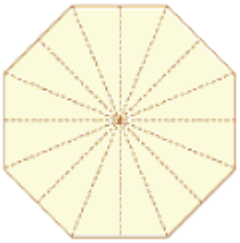
5. Fold the triangle in half, making a narrower triangle.



6. Cut off the top edge, making all the edges even.



7. Unfold



Resource Sheet 7

Exit Slip

Name ________________________________ Date ______________________

1. How many one-degree angles are in a full circle? ____________________
2. An angle that makes a full turn through a circle measures ________ degrees.
3. What fraction of a circle is a 180° angle? __________________________
4. What fraction of a circle is a 90° angle? ___________________________

Challenge: What fraction of a circle is a 45° angle? _____________________

Challenge: What fraction of a circle is a 60° angle? _____________________

✂ -

Resource Sheet 7

Exit Slip

Name ________________________________ Date ______________________

5. How many one-degree angles are in a full circle? ____________________
6. An angle that makes a full turn through a circle measures ________ degrees.
7. What fraction of a circle is a 180° angle? __________________________
8. What fraction of a circle is a 90° angle? ___________________________

Challenge: What fraction of a circle is a 45° angle? _____________________

Challenge: What fraction of a circle is a 60° angle? _____________________

Guam District Level Lesson Plan Quarter: 3rd

Content: Math	**Grade/Course**: 4th	**Timeline**: week 7/8

Standard(s):

4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

I CAN MEASURE ANGLES IN WHOLE NUMBER DEGREES USING A PROTRACTOR.
I CAN SKETCH ANGLES OF SPECIFIED MEASURE.
I CAN DECOMPOSED ANGLES INTO SMALLER ANGLES.

Review from previous lesson.
4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

Lesson Overview:
Lesson Overview:
Big Idea 2: Students will understand that geometric figures can be analyzed and classified based on their properties, such as having parallel lines, particular angle measures, and symmetry.

What are the variety of situations that angles can be presented?

Prior Knowledge before lesson:
Students should have experiences with the following prior to this lesson.

- Types of angles: acute, obtuse, right, straight angles
- Understanding that two rays that share an endpoint (vertex) form an angle
- Sorting quadrilaterals by types of angles

Note: Prior to the lesson, consider having struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.

The key lessons for students in this Big Idea are as follows:

An angle can be decomposed into smaller angles that do not overlap (4.MD.7).

The measure of an angle is equal to the sum of the measures of the decomposed angles (4.MD.7).

If we know the measure of the angle and one or more of the smaller angles within, we can find the measure of an unknown part (4.MD.7).

Vocabulary:	**Focus Question(s)**:
Angles Angle measure Protractor Acute Obtuse Right Circle Degrees	How do you model angles? How do you decompose angles? How do we explain angle measure as additive? How do you solve for unknown angles?
INSTRUCTIONAL STRATEGIES:	
ONLINE: CAN ANGLES BE DECOMPOSED? EXPLAIN WHAT IS "DECOMPOSED" MEAN. https://learnzillion.com/resources/72593-recognize-angle-measure-as-additive-4-md-c-7 https://www.opened.com/search?category=measurement-and-data&grade_group=elementary&offset=0&standard=4.MD.7&standard_group=common-core-math	

ONLINE INTRODUCTION REVIEW/ IDEAS: http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Relevance/ Connection:

- Clocks are circles and the hands form different types of angles as they move around the clock face
- In various sports, athletes often refer to "doing a 360, a 180," etc. and they are referring to the amount of turns around a circle they are completing.

MOTIVATION:

Materials Needed

One of these video clips:

- Kobe Bryant 360 degree dunk

  http://www.youtube.com/watch?v=jfD8aWe1QdA

- Vince Carter 360 degree dunk

  http://www.youtube.com/watch?v=4rLL_g3GZtg

- Vince Carter 180 degree dunk

  http://www.youtube.com/watch?v=7mG4MmddLos

Directions:

1. Have students brainstorm in pairs or trios: When have you heard 360, 180, 90 degrees? (Example: Doing a 360 or a 180 in sports such as basketball or ice skating)
2. Optional: After students have had a few minutes to brainstorm, view one of the video clips listed below:
   - Kobe Bryant 360 degree dunk

     http://www.youtube.com/watch?v=jfD8aWe1QdA

   - Vince Carter 360 degree dunk

     http://www.youtube.com/watch?v=4rLL_g3GZtg

   - Vince Carter 180 degree dunk

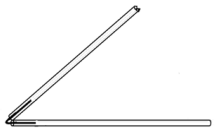
     http://www.youtube.com/watch?v=7mG4MmddLos

Materials Needed:

- Straws (two or each student)

- 3-inch pieces of pip cleaner (one for each student)

Part 1
Each student makes an "angle explorer"
- Give each student 2 straws and a length of pipe cleaner approximately 3 inches long.
- Students bend the pipe cleaner in half and insert each end into the straws.



Part 2
- Have students show different types of angles with their angle explorer (acute, obtuse, right, straight)
- Discuss: Angles are formed by two rays sharing an endpoint like two clock hands. Have students identify the vertex and the two rays on their angle explorer.
- Have students work in pairs.
- Give students different times such as 1:15, 12:30, 2:35. Students should move the clock hands to the given times and match with angle explorer. Have them identify the types of angles formed with their partner.

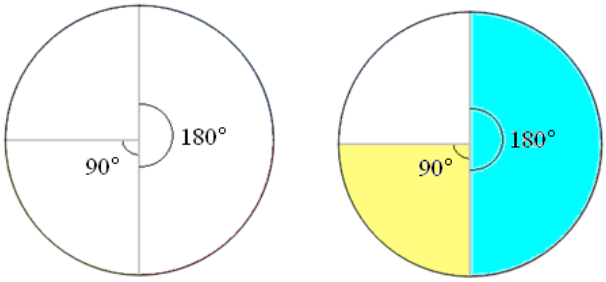
Day 2: How is a circle measured?

Materials Needed:
- Resource Sheet 4: Paper Circle (one circle for each student)

Directions:
- Ask students if they know how a circle is measured. Refer back to the Motivation Activity.
- Discuss that a full circle is 360° and that circles and angles are measured in degrees. The angle measurement is measuring the spread of the rays in a circle. Introduce the degree symbol. Relate to clocks and the movement of the clock hands.
- Give each student a paper circle with the center point marked from Resource Sheet 4: Paper Circle.
- Have students fold the circle in half and then trace over the line. Encourage them to be as exact as possible.
- Ask: If a circle equal 360°, what would ½ circle equal?
- Label half circle 180. (See example.)

- Have students fold circle in ½ again, creating four sections and trace over the line.

Ask: Think Pair Share (students discuss amongst each other)
- How many sections do you have now? (4)
- What fraction of the circle would one section be? (1/4)
- Remember that half of a circle is 180° so how many degrees would ¼ of a circle be? (90°)
- What fraction of the circle is 90° (1/4)
- A full circle is 360°. Is 90° ¼ of 360°?
- Have students label 90° on their circle.



Note: Students who have difficulty visualizing the parts of a circle could color the angles as shown above.

- Have students use their angle explorer from Activity 1 to form 90° angle and a 180° angle and lay on top of the lines on their circle to model the two types of angles.

Day 3: Making and Using a Wax Paper Protractor

1. Pass out square of wax paper and Resource Sheet 5: Angle Worksheet (which displays 3 circles – ¼, $^1/_8$, $^1/_{16}$).
2. Using the beginning directions on Resource Sheet 6: Making a Wax Paper Protractor, ask students to fold the wax paper in half and then in half again.
3. Once students have folded the wax paper twice, making fourths, have students lay their "protractor" on the paper circle showing fourths on Resource Sheet 5: Angle Worksheet.
4. Model how to line the vertex up and rotate it around the circle 4 times to complete the circle.
5. Have students verbalize that it is fourths because there are four sections and the protractor needs to be rotated 4 times to cover the four sections.
6. Have students fold the wax paper again and repeat step 3 for eighths, as stated on Resource Sheet 6.
7. Have students fold the wax paper again and repeat step 3 for sixteenths.
8. Discuss: Could students continue to fold the wax paper, making smaller and smaller "wedges"? (Theoretically, yes. They can't with the wax paper because the wedges become too small to fold anymore.)

9. Ask:
    - How many "wedges" in a full circle? (360)
    - How do you know? (360° in a circle)
    - What is the measure of each of these wedges? (1°)

Day 4: Closure

Materials Needed:

- Resource Sheet 7: Exit Ticket

Wrap Up:

1) Distribute Resource Sheet 7: Exit Ticket and allow time for students to complete it.
2) Collect the Exit Ticket from each student and ask them to join you up front for a class discussion.
3) Discussion: Refer back to the motivation.
   - Talk about why something is called a 180, a 360, etc?
   - What would two complete turns be called?
   - Show clip of Shaun White doing a 1260.
     http://www.youtube.com/watch?v=qIr2ki4nWkU
     http://www.youtube.com/watch?v=oF-jmHTYLBQ

Ask student how many turns is a 1260? Prove your answer

Interventions/ Enrichments:

Special Education/Struggling Learners and ELL students:

- Prior to the lesson, consider having struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.
- Students who have difficulty visualizing the parts of a circle could color the angles as shown in Activity 2

ELL students

- Provide a vocabulary sheet identifying and illustrating the different types of angles (acute, obtuse, right, straight)

Gifted and Talented

- Babylonians – share what they learn

Challenge problems are included on the exit slip for enrichment purposes

- Resource Sheet 1: Background Information for the Teacher (Read prior to lesson.)
- Resource Sheet 2: Pretest
- Resource Sheet 3: Pretest Answer Key
- Judy clocks (one per student and teacher)
- One of these video clips:
- Kobe Bryant 360 degree dunk
  - http://www.youtube.com/watch?v=jfD8aWe1QdA
- Vince Carter 360 degree dunk
  - http://www.youtube.com/watch?v=4rLL_g3GZtg
- Vince Carter 180 degree dunk

- http://www.youtube.com/watch?v=7mG4MmddLos

- Straws – 2 per student
- 3-inch length of pipe cleaner – 1 per student
- Resource Sheet 4: Paper Circle (one circle for each student)

- Wax Paper Squares (one for each student)
- Resource Sheet 5: Angle Worksheet
- Resource Sheet 6: Making a Wax Paper Protractor (one for the teacher)
- Resource Sheet 7: Exit Ticket

Summary:
By the end of this activity students should be able to identify three types of angles, know that angles are measured in degrees, and be able to measure angles using protractors or angle rulers.

Prior knowledge needed to complete this activity: Be able to identify parallel, intersecting, and perpendicular lines. By the end of this activity students should be able to identify:

REVIEW:
Right angle: A 90-degree angle
Acute angle: An angle that is less than 90 degrees
Obtuse angle: An angle that is greater than 90 degrees
Know that angles are measured in degrees and develop benchmark angles (e.g. 45 degrees, 60 degrees, 120 degrees) and be able to measure angles using protractors or angle rulers.

Extended Activities to do with your class:

Intended Learning Outcomes:
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

Instructional Procedures:
Invitation to Learn

Divide class into two groups. Have them stand arm length apart in a circle. Give each group a ball of yarn. Instruct them to pass the yarn to make a web. They may not pass the yarn to the person next to them; encourage them to pass across the circle as much as possible. Each child needs to hold onto the yarn and not let go. When they are all holding onto the yarn have them carefully lay their web down on the ground, stretching it slightly so the yarn is in straight lines.

Review parallel, intersecting, and perpendicular lines by finding them within the web. Have students identify the places where the lines intersect and mark them with points. Explain that when two lines meet together at one point we call that the VERTEX and that the lines, which are called rays, extending from the vertex form an ANGLE. Now look at the web to see if you can identify angles. Review how lines are named by points. Explain that angles are named using three points, with the vertex point always in the middle (ABC) and that we use this symbol < for angle. (

Instructional Procedure

1. **Classifying Angles** (Right, acute, obtuse) Before the lesson prepare 12 angle cards. Use cardstock and draw one angle on each card–make 4 right angles, 4 acute angles, and 4 obtuse angles. Label the points and write the angle name.

   Place the angle cards on the board. Ask the class to carefully examine them and see if they can classify them into three groups. Have students come to board and move the angle cards into three groups. Continue working until students have correctly grouped them into right, acute, and obtuse angles. Write the name of each type of angle above the cards. Have class practice reading the names and identify the characteristics of each.

   Identifying Angles

Put students into small groups or partners. Give each group a set of pattern blocks.

Tell them they need to look at each type of pattern block and identify the types of angles on each. Give each student a piece of art paper. Have them divide it into three sections labeled: Right Angle, Obtuse Angle, and Acute Angle. Have them trace the angles of the pattern blocks into the correct section.

2. **Identifying Benchmark Angles using fraction circles**

Give each student a copy of the 360-degree Circle worksheet, which has been copied on cardstock.

Discuss how a circle has 360 degrees. Link it to skateboard and snowboard tricks like the 180 and the 360. As you discuss each one have the students find it on their 360-degree Circle worksheet.

If you divide a circle in half how many degrees to you have? 180. Have them jump and spin and try to land at 180 degrees. Now start at 0 degrees on your circle and trace your finger around to 180 degrees. What about a half of the half? That would be 90 degrees. Jump 90 degrees at a time and see if they can figure out the degrees–link it to the 9 times tables. So if you could jump all the way around you would be doing a 360!

Have students put away their 360 degrees Circle paper so they cannot see it during the following activity. Give each student a piece of 9 x 12 art paper. Put students into partners and give each group a set of fraction circles cut out of foam board. You need to have a whole, halves, fourths, eighths, sixths, and thirds.

Have students fold their art paper to make four boxes. Have them trace their whole circle in each of the boxes on the front and in two boxes on the back. (Total of 6 boxes)

Work with students to identify the benchmark angles.

Begin with the whole circle. Review how many degrees are in a complete circle. Write: “A whole circle has 360 degrees”. Ask how much of the circle 180 degrees would be. Have them find the fraction pieces that would cover half the circle. In the second box have the students trace the halves onto the circle, write 180 degrees on the circle in the correct place, trace the 180-degree angle in crayon and shade it in. Above the circle write “180 degrees is half the circle.” (You can also teach your students that this is called a straight angle)

Note: As you do these fraction pieces make sure they lay the first fraction piece so its baseline is on the 0 degree line of the circle, this will form the angle correctly.

Have students fold their art paper to make four boxes. Have them trace their whole circle in each of the boxes on the front and in two boxes on the back. (Total of 6 boxes)

Work with students to identify the benchmark angles.

Begin with the whole circle. Review how many degrees are in a complete circle. Write: "A whole circle has 360 degrees". Ask how much of the circle 180 degrees would be. Have them find the fraction pieces that would cover half the circle. In the second box have the students trace the halves onto the circle, write 180 degrees on the circle in the correct place, trace the 180-degree angle in crayon and shade it in. Above the circle write "180 degrees is half the circle." (You can also teach your students that this is called a straight angle)

Note: As you do these fraction pieces make sure they lay the first fraction piece so its baseline is on the 0 degree line of the circle, this will form the angle correctly.

Continue with 90 degrees. Remind them how far they had to jump. How could you relate 90 degrees to a fraction of your circle? Lay your fraction pieces on your circle and see which ones correspond to 90 degrees on the circle. Find the fractions that would make 90-degree angles. Trace the fourths, highlight the first one-fourth, and label 90 degrees on the circle and then above the circle write "90 degrees is 1/4 of the circle". As you work through the rest of these angles have the students compare them to the 90-degree angle to give them a reference point.

Repeat for 45 degrees, 60 degrees, and 120 degrees.

1. **Make an angle manipulative**. Give each student two 1" x 6" strips of oaktag and a fastener.

   Draw a ray on each strip. Mark an endpoint on each ray, then put the strips together to form a vertex and put the fastener through them. Make a larger version for you to use to demonstrate on the board. Have them look at their fraction circle papers and try to reproduce the angles using their angle manipulatives.

2. **Formative Assessment:** Have students use whiteboards or white art paper and crayons. Example: Draw two angles, one 90 degrees and one 45 degrees, on the board or overhead. Instruct students to copy the 90-degree angle. Have them hold up their white boards or papers to check. Continue with other angle comparisons; include right, acute, and obtuse angles also.
3. **Measuring Angles using an angle ruler or protractor**

   Show students an angle ruler and a protractor; explain that these are the tools we use for measuring angles. Demonstrate how they work. Put students into partners and let them experiment with the tools. Draw different angles on the overhead and measure them. Have students draw and measure them with you. Have students use their angle manipulative. Have them work in partners. One student will make an angle using their manipulative; the other student will use the angle ruler or the protractor to measure the angle.

4. **Play "What's Your Angle?"**

Draw angles on the board or overhead. Have students estimate and write down the angle's degrees. Then have students come up and measure. If their estimate is exactly correct they get 10

points. Deduct one point for every degree they are off—if they are one degree off they will get 9 points, continuing down to 9 degrees off they will get 1 point, 10 or more degrees off they will get 0 points. Variation: Play STOP! Use a large angle manipulative on the board. Tape the bottom ray so that it stays at 0 degrees. Identify the degree of angle you want to make. Choose a student to come to the front. Their job is to yell, "STOP" when they think you have made that degree of angle. They can solicit help from the other students. Move the other ray slowly (remember that angles are measured going counterclockwise) The student yells stop when they think you have reached the correct degree. Tape the ray down and measure the angle. Choose your "winner" criteria before starting. Example: They have to be within 5 degrees to win. If they win give them a small treat.

Family Connections

- Have students enlist the help of their families to go on an "Angle Hunt" at their homes. Have them find and describe at least one example of each type of angle.

Assessment Plan:
Use the *Angle Assessment* blackline as a final assessment.

Accommodations/Modifications:

Extensions:

- Struggling learners can be paired with more advanced learners
- Angle Tangle: Assign students to draw 5-7 straight lines with several intersections. Then connect the endpoints of the lines. Mark the angles created within in the design and color code them by right, acute, and obtuse angles. Color the rest of the design.
- String Art: Do a line design but give students string, oaktag, and safe plastic needles. Have them make the design using the string.
- Use AngLegs sets which include connecting pieces to form angles and a protractor that attaches to the pieces for independent practice in measuring angles.
- Integrating Technology: Take a digital camera and take your class on an "Angle Hunt". Have them identify angles in architecture, machines, nature, etc. Take photographs of the students and the angles. Use them to make a Power Point presentation.

Resources (Textbook and Supplemental):

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http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Spectrum Workbook: pages 116, 117,

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Links for Motivation Activity:

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Online Resources:

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www.mathplayground.com/measuringangles.html
Practice reading a protractor. The protractor is already lined up with the vertex of each angle, but the protractor needs to be rotated into the proper position. The angle measure is reported in whole numbers and the margin of error is only 1°.

Alien Angles game:
www.mathplayground.com/alienangles.html
Alien Angles game: Practice estimating angles with this game. It is challenging and some students might find it frustrating.

Creating Practice Worksheets:
www.worksheetworks.com/math/geometry/measuring-angles.html
This site allows the teacher to create a practice worksheet that provides students with a set of angles that they measure with a protractor. Teachers are able to specify the range of angles used on the worksheet and are able to make the measuring easier by not rotating the angle, which will keep the base of the angle always horizontal on the worksheet.

Guam District Level Lesson Plan Quarter: 3rd

Content: Math	**Grade/Course**: 4th	**Timeline**: week 8 REVIEW SKILLS

Standard(s):

4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

I CAN MEASURE ANGLES IN WHOLE NUMBER DEGREES USING A PROTRACTOR.
I CAN SKETCH ANGLES OF SPECIFIED MEASURE.
I CAN DECOMPOSED ANGLES INTO SMALLER ANGLES.

Review from previous lessons.

4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

4.NBT.4 I can add and subtract large numbers

4.NBT.5 I can multiply large numbers

4.NF.1 I can recognize and form equivalent fractions

4.NF.3/c I can subtract mixed numbers

Lesson Overview:

Big Idea 2: Students will understand that geometric figures can be analyzed and classified based on their properties, such as having parallel lines, particular angle measures, and symmetry.

What are the variety of situations that angles can be presented?

Prior Knowledge before lesson:

Students should have experiences with the following prior to this lesson.

- Types of angles: acute, obtuse, right, straight angles
- Understanding that two rays that share an endpoint (vertex) form an angle
- Sorting quadrilaterals by types of angles

Note: Prior to the lesson, consider having

The key lessons for students in this Big Idea are as follows:

An angle can be decomposed into smaller angles that do not overlap (4.MD.7).

The measure of an angle is equal to the sum of the measures of the decomposed angles (4.MD.7).

If we know the measure of the angle and one or more of the smaller angles within, we can find the measure of an unknown part (4.MD.7).

struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.	
Vocabulary: Angles Angle measure Protractor Acute Obtuse Right Circle Degrees	**Focus Question(s)**: How do you model angles? How do you decompose angles? How do we explain angle measure as additive? How do you solve for unknown angles?
INSTRUCTIONAL STRATEGIES:	
ONLINE: CAN ANGLES BE DECOMPOSED? EXPLAIN WHAT IS "DECOMPOSED" MEAN. https://learnzillion.com/resources/72593-recognize-angle-measure-as-additive-4-md-c-7 https://www.opened.com/search?category=measurement-and-data&grade_group=elementary&offset=0&standard=4.MD.7&standard_group=common-core-math	

ONLINE INTRODUCTION REVIEW/ IDEAS: http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Relevance/ Connection:

- Clocks are circles and the hands form different types of angles as they move around the clock face
- In various sports, athletes often refer to "doing a 360, a 180," etc. and they are referring to the amount of turns around a circle they are completing.

MOTIVATION:

Materials Needed

One of these video clips:

- Kobe Bryant 360 degree dunk

  http://www.youtube.com/watch?v=jfD8aWe1QdA

- Vince Carter 360 degree dunk

  http://www.youtube.com/watch?v=4rLL_g3GZtg

- Vince Carter 180 degree dunk

  http://www.youtube.com/watch?v=7mG4MmddLos

Directions:

1. Have students brainstorm in pairs or trios: When have you heard 360, 180, 90 degrees? (Example: Doing a 360 or a 180 in sports such as basketball or ice skating)
2. Optional: After students have had a few minutes to brainstorm, view one of the video clips listed below:
   - Kobe Bryant 360 degree dunk

     http://www.youtube.com/watch?v=jfD8aWe1QdA

   - Vince Carter 360 degree dunk

     http://www.youtube.com/watch?v=4rLL_g3GZtg

   - Vince Carter 180 degree dunk

     http://www.youtube.com/watch?v=7mG4MmddLos

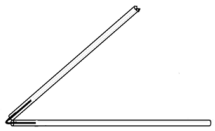
Materials Needed:

- Straws (two or each student)
- 3-inch pieces of pip cleaner (one for each student)

Part 1

Each student makes an "angle explorer"

- Give each student 2 straws and a length of pipe cleaner approximately 3 inches long.
- Students bend the pipe cleaner in half and insert each end into the straws.



Part 2

- Have students show different types of angles with their angle explorer (acute, obtuse, right, straight)
- Discuss: Angles are formed by two rays sharing an endpoint like two clock hands. Have students identify the vertex and the two rays on their angle explorer.
- Have students work in pairs.
- Give students different times such as 1:15, 12:30, 2:35. Students should move the clock hands to the given times and match with angle explorer. Have them identify the types of angles formed with their partner.

Day 2: How is a circle measured?

Materials Needed:

- Resource Sheet 4: Paper Circle (one circle for each student)

Directions:

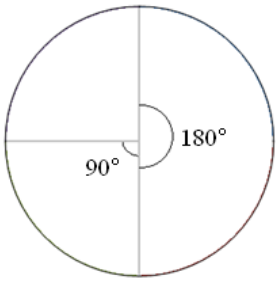
- Ask students if they know how a circle is measured. Refer back to the Motivation Activity.
- Discuss that a full circle is 360° and that circles and angles are measured in degrees. The angle measurement is measuring the spread of the rays in a circle. Introduce the degree symbol. Relate to clocks and the movement of the clock hands.
- Give each student a paper circle with the center point marked from Resource Sheet 4: Paper Circle.
- Have students fold the circle in half and then trace over the line. Encourage them to be as exact as possible.
- Ask: If a circle equal 360°, what would ½ circle equal?
- Label half circle 180. (See example.)

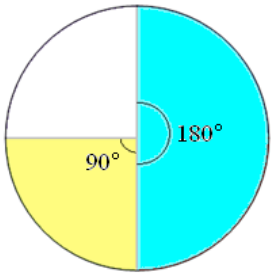
- Have students fold circle in ½ again, creating four sections and trace over the line.

Ask: Think Pair Share (students discuss amongst each other)

- How many sections do you have now? (4)
- What fraction of the circle would one section be? (1/4)
- Remember that half of a circle is 180° so how many degrees would ¼ of a circle be? (90°)
- What fraction of the circle is 90° (1/4)

- A full circle is 360°. Is 90° ¼ of 360°?
- Have students label 90° on their circle.





Note: Students who have difficulty visualizing the parts of a circle could color the angles as shown above.

- Have students use their angle explorer from Activity 1 to form 90° angle and a 180° angle and lay on top of the lines on their circle to model the two types of angles.

Day 3: Making and Using a Wax Paper Protractor

1. Pass out square of wax paper and Resource Sheet 5: Angle Worksheet (which displays 3 circles – ¼, $^1/_8$, $^1/_{16}$).
2. Using the beginning directions on Resource Sheet 6: Making a Wax Paper Protractor, ask students to fold the wax paper in half and then in half again.
3. Once students have folded the wax paper twice, making fourths, have students lay their "protractor" on the paper circle showing fourths on Resource Sheet 5: Angle Worksheet.
4. Model how to line the vertex up and rotate it around the circle 4 times to complete the circle.
5. Have students verbalize that it is fourths because there are four sections and the protractor needs to be rotated 4 times to cover the four sections.
6. Have students fold the wax paper again and repeat step 3 for eighths, as stated on Resource Sheet 6.
7. Have students fold the wax paper again and repeat step 3 for sixteenths.
8. Discuss: Could students continue to fold the wax paper, making smaller and smaller "wedges"? (Theoretically, yes. They can't with the wax paper because the wedges become too small to fold anymore.)

9. Ask:
    - How many "wedges" in a full circle? (360)
    - How do you know? (360° in a circle)
    - What is the measure of each of these wedges? (1°)

Day 4: Closure

Materials Needed:

- Resource Sheet 7: Exit Ticket

Wrap Up:

1) Distribute Resource Sheet 7: Exit Ticket and allow time for students to complete it.
2) Collect the Exit Ticket from each student and ask them to join you up front for a class discussion.
3) Discussion: Refer back to the motivation.
   - Talk about why something is called a 180, a 360, etc?
   - What would two complete turns be called?
   - Show clip of Shaun White doing a 1260.
     http://www.youtube.com/watch?v=qIr2ki4nWkU
     http://www.youtube.com/watch?v=oF-jmHTYLBQ

Ask student how many turns is a 1260? Prove your answer

Interventions/ Enrichments:

Special Education/Struggling Learners and ELL students:

- Prior to the lesson, consider having struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.
- Students who have difficulty visualizing the parts of a circle could color the angles as shown in Activity 2

ELL students

- Provide a vocabulary sheet identifying and illustrating the different types of angles (acute, obtuse, right, straight)

Gifted and Talented

- Babylonians – share what they learn

Challenge problems are included on the exit slip for enrichment purposes

- Resource Sheet 1: Background Information for the Teacher (Read prior to lesson.)
- Resource Sheet 2: Pretest
- Resource Sheet 3: Pretest Answer Key
- Judy clocks (one per student and teacher)
- One of these video clips:
- Kobe Bryant 360 degree dunk
  - http://www.youtube.com/watch?v=jfD8aWe1QdA
- Vince Carter 360 degree dunk

    - http://www.youtube.com/watch?v=4rLL_g3GZtg
- Vince Carter 180 degree dunk
    - http://www.youtube.com/watch?v=7mG4MmddLos
- Straws – 2 per student
- 3-inch length of pipe cleaner – 1 per student
- Resource Sheet 4: Paper Circle (one circle for each student)

- Wax Paper Squares (one for each student)
- Resource Sheet 5: Angle Worksheet
- Resource Sheet 6: Making a Wax Paper Protractor (one for the teacher)
- Resource Sheet 7: Exit Ticket

Summary:
By the end of this activity students should be able to identify three types of angles, know that angles are measured in degrees, and be able to measure angles using protractors or angle rulers.

Prior knowledge needed to complete this activity: Be able to identify parallel, intersecting, and perpendicular lines. By the end of this activity students should be able to identify:

REVIEW:
Right angle: A 90-degree angle
Acute angle: An angle that is less than 90 degrees
Obtuse angle: An angle that is greater than 90 degrees
Know that angles are measured in degrees and develop benchmark angles (e.g. 45 degrees, 60 degrees, 120 degrees) and be able to measure angles using protractors or angle rulers.

Extended Activities to do with your class:

Intended Learning Outcomes:
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

Instructional Procedures:
Invitation to Learn

Divide class into two groups. Have them stand arm length apart in a circle. Give each group a ball of yarn. Instruct them to pass the yarn to make a web. They may not pass the yarn to the person next to them; encourage them to pass across the circle as much as possible. Each child needs to hold onto the yarn and not let go. When they are all holding onto the yarn have them carefully lay their web down on the ground, stretching it slightly so the yarn is in straight lines.

Review parallel, intersecting, and perpendicular lines by finding them within the web. Have students identify the places where the lines intersect and mark them with points. Explain that when two lines meet together at one point we call that the VERTEX and that the lines, which are called rays, extending from the vertex form an ANGLE. Now look at the web to see if you can identify angles. Review how lines are named by points. Explain that angles are named using three points, with the vertex point always in the middle (ABC) and that we use this symbol < for angle. (

Instructional Procedure

1. **Classifying Angles** (Right, acute, obtuse) Before the lesson prepare 12 angle cards. Use cardstock and draw one angle on each card–make 4 right angles, 4 acute angles, and 4 obtuse angles. Label the points and write the angle name.

   Place the angle cards on the board. Ask the class to carefully examine them and see if they can classify them into three groups. Have students come to board and move the angle cards into three groups. Continue working until students have correctly grouped them into right, acute, and obtuse angles. Write the name of each type of angle above the cards. Have class practice reading the names and identify the characteristics of each.

   Identifying Angles

Put students into small groups or partners. Give each group a set of pattern blocks.

Tell them they need to look at each type of pattern block and identify the types of angles on each. Give each student a piece of art paper. Have them divide it into three sections labeled: Right Angle, Obtuse Angle, and Acute Angle. Have them trace the angles of the pattern blocks into the correct section.

2. **Identifying Benchmark Angles using fraction circles**

Give each student a copy of the 360-degree Circle worksheet, which has been copied on cardstock.

Discuss how a circle has 360 degrees. Link it to skateboard and snowboard tricks like the 180 and the 360. As you discuss each one have the students find it on their 360-degree Circle worksheet.

If you divide a circle in half how many degrees to you have? 180. Have them jump and spin and try to land at 180 degrees. Now start at 0 degrees on your circle and trace your finger around to 180 degrees. What about a half of the half? That would be 90 degrees. Jump 90 degrees at a time and see if they can figure out the degrees–link it to the 9 times tables. So if you could jump all the way around you would be doing a 360!

Have students put away their 360 degrees Circle paper so they cannot see it during the following activity. Give each student a piece of 9 x 12 art paper. Put students into partners and give each group a set of fraction circles cut out of foam board. You need to have a whole, halves, fourths, eighths, sixths, and thirds.

Have students fold their art paper to make four boxes. Have them trace their whole circle in each of the boxes on the front and in two boxes on the back. (Total of 6 boxes)

Work with students to identify the benchmark angles.

Begin with the whole circle. Review how many degrees are in a complete circle. Write: “A whole circle has 360 degrees”. Ask how much of the circle 180 degrees would be. Have them find the fraction pieces that would cover half the circle. In the second box have the students trace the halves onto the circle, write 180 degrees on the circle in the correct place, trace the 180-degree angle in crayon and shade it in. Above the circle write “180 degrees is half the circle.” (You can also teach your students that this is called a straight angle)

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Continue with 90 degrees. Remind them how far they had to jump. How could you relate 90 degrees to a fraction of your circle? Lay your fraction pieces on your circle and see which ones correspond to 90 degrees on the circle. Find the fractions that would make 90-degree angles. Trace the fourths, highlight the first one-fourth, and label 90 degrees on the circle and then above the circle write "90 degrees is 1/4 of the circle". As you work through the rest of these angles have the students compare them to the 90-degree angle to give them a reference point.

Repeat for 45 degrees, 60 degrees, and 120 degrees.

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Extensions:

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Guam District Level Lesson Plan Quarter: 3rd

Content: Math	**Grade/Course**: 4th	**Timeline**: **week 9 REVIEW SKILLS / TESTING / ASSESSMENTS**

Standard(s):

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I CAN SKETCH ANGLES OF SPECIFIED MEASURE.
I CAN DECOMPOSED ANGLES INTO SMALLER ANGLES.

Review from previous lessons.

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4.NBT.5 I can multiply large numbers

4.NF.1 I can recognize and form equivalent fractions

4.NF.3/c I can subtract mixed numbers

ASSESSMENTS / TESTING FINAL WEEK FOR 3RD QTR.

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The measure of an angle is equal to the sum of the measures of the decomposed angles (4.MD.7).

If we know the measure of the angle and one or more of the smaller angles within, we can find the measure of an unknown part (4.MD.7).

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INSTRUCTIONAL STRATEGIES:
DAY 1: REVIEW

4.NF.3c Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

4.NF.3d Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Review Lessons

Standard(s): **4.NF.3a** Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

4.NF.3b Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

I Can estimate a fraction that is less than 1.
I can explore adding fractions that have like denominators and a sum less than 1.
I can subtract fractions that have like denominators and a different less than 1.

DAY 2: REVIEW

4.MD.5.a Recognize **angles** as **geometric shapes** that are formed wherever two **rays** share a common endpoint, and understand concepts of **angle measurement**: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.

DOK 1: Classify the following angles.
What is the measurement of the shaded portion of the following angles?

Draw a 90 degrees see file

180 degrees see file

I can identify line segments, lines, and rays
I can identify angles, including acute angles, right angles, and obtuse angles.
I can recognize angles as geometric shapes.

DAY 3: REVIEW

4.MD.5.b Recognize **angles** as geometric shapes that are formed wherever two **rays** share a common endpoint, and understand concepts of angle measurement: b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

I can recognize angles as geometric shapes.

I can recognize that an angle is part of a circle.

I can recognize one-degree angle that can be used to measure other angles.

DAY 4: REVIEW

4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

I CAN MEASURE ANGLES IN WHOLE NUMBER DEGREES USING A PROTRACTOR.
I CAN SKETCH ANGLES OF SPECIFIED MEASURE.
Online Resources:

Measuring Angles with a Protractor:
www.mathplayground.com/measuringangles.html
Practice reading a protractor. The protractor is already lined up with the vertex of each angle, but the protractor needs to be rotated into the proper position. The angle measure is reported in whole numbers and the margin of error is only 1°.

Alien Angles game:
www.mathplayground.com/alienangles.html

Alien Angles game: Practice estimating angles with this game. It is challenging and some students might find it frustrating. Creating Practice Worksheets: *www.worksheetworks.com/math/geometry/measuring-angles.html* This site allows the teacher to create a practice worksheet that provides students with a set of angles that they measure with a protractor. Teachers are able to specify the range of angles used on the worksheet and are able to make the measuring easier by not rotating the angle, which will keep the base of the angle always horizontal on the worksheet.
ONLINE: CAN ANGLES BE DECOMPOSED? EXPLAIN WHAT IS "DECOMPOSED" MEAN. https://learnzillion.com/resources/72593-recognize-angle-measure-as-additive-4-md-c-7 https://www.opened.com/search?category=measurement-and-data&grade_group=elementary&offset=0&standard=4.MD.7&standard_group=common-core-math

PREVIOUS LESSONS CONTINUE: REVIEW
ONLINE INTRODUCTION REVIEW/ IDEAS: http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Relevance/ Connection:

- Clocks are circles and the hands form different types of angles as they move around the clock face
- In various sports, athletes often refer to "doing a 360, a 180," etc. and they are referring to the amount of turns around a circle they are completing.

MOTIVATION:
Materials Needed
One of these video clips:

- Kobe Bryant 360 degree dunk

  http://www.youtube.com/watch?v=jfD8aWe1QdA

- Vince Carter 360 degree dunk

  http://www.youtube.com/watch?v=4rLL_g3GZtg

- Vince Carter 180 degree dunk

  http://www.youtube.com/watch?v=7mG4MmddLos

Directions:

1. Have students brainstorm in pairs or trios: When have you heard 360, 180, 90 degrees? (Example: Doing a 360 or a 180 in sports such as basketball or ice skating)
2. Optional: After students have had a few minutes to brainstorm, view one of the video clips listed below:
   - Kobe Bryant 360 degree dunk

     http://www.youtube.com/watch?v=jfD8aWe1QdA

   - Vince Carter 360 degree dunk

     http://www.youtube.com/watch?v=4rLL_g3GZtg

   - Vince Carter 180 degree dunk

     http://www.youtube.com/watch?v=7mG4MmddLos

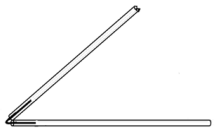
Materials Needed:

- Straws (two or each student)
- 3-inch pieces of pip cleaner (one for each student)

Part 1

Each student makes an "angle explorer"

- Give each student 2 straws and a length of pipe cleaner approximately 3 inches long.
- Students bend the pipe cleaner in half and insert each end into the straws.



Part 2

- Have students show different types of angles with their angle explorer (acute, obtuse, right, straight)
- Discuss: Angles are formed by two rays sharing an endpoint like two clock hands. Have students identify the vertex and the two rays on their angle explorer.
- Have students work in pairs.
- Give students different times such as 1:15, 12:30, 2:35. Students should move the clock hands to the given times and match with angle explorer. Have them identify the types of angles formed with their partner.

Day 2: How is a circle measured?

Materials Needed:

- Resource Sheet 4: Paper Circle (one circle for each student)

Directions:

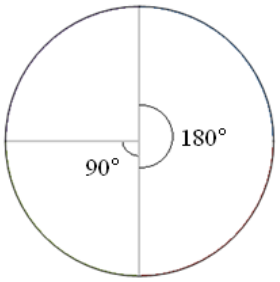
- Ask students if they know how a circle is measured. Refer back to the Motivation Activity.
- Discuss that a full circle is 360° and that circles and angles are measured in degrees. The angle measurement is measuring the spread of the rays in a circle. Introduce the degree symbol. Relate to clocks and the movement of the clock hands.
- Give each student a paper circle with the center point marked from Resource Sheet 4: Paper Circle.
- Have students fold the circle in half and then trace over the line. Encourage them to be as exact as possible.
- Ask: If a circle equal 360°, what would ½ circle equal?
- Label half circle 180. (See example.)

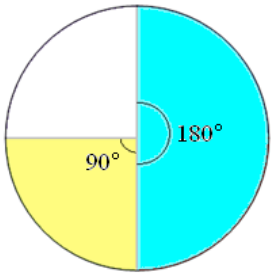
- Have students fold circle in ½ again, creating four sections and trace over the line.

Ask: Think Pair Share (students discuss amongst each other)

- How many sections do you have now? (4)
- What fraction of the circle would one section be? (1/4)
- Remember that half of a circle is 180° so how many degrees would ¼ of a circle be? (90°)
- What fraction of the circle is 90° (1/4)

- A full circle is 360°. Is 90° ¼ of 360°?
- Have students label 90° on their circle.





Note: Students who have difficulty visualizing the parts of a circle could color the angles as shown above.

- Have students use their angle explorer from Activity 1 to form 90° angle and a 180° angle and lay on top of the lines on their circle to model the two types of angles.

Day 3: Making and Using a Wax Paper Protractor

1. Pass out square of wax paper and Resource Sheet 5: Angle Worksheet (which displays 3 circles – ¼, $^1/_8$, $^1/_{16}$).
2. Using the beginning directions on Resource Sheet 6: Making a Wax Paper Protractor, ask students to fold the wax paper in half and then in half again.
3. Once students have folded the wax paper twice, making fourths, have students lay their "protractor" on the paper circle showing fourths on Resource Sheet 5: Angle Worksheet.
4. Model how to line the vertex up and rotate it around the circle 4 times to complete the circle.
5. Have students verbalize that it is fourths because there are four sections and the protractor needs to be rotated 4 times to cover the four sections.
6. Have students fold the wax paper again and repeat step 3 for eighths, as stated on Resource Sheet 6.
7. Have students fold the wax paper again and repeat step 3 for sixteenths.
8. Discuss: Could students continue to fold the wax paper, making smaller and smaller "wedges"? (Theoretically, yes. They can't with the wax paper because the wedges become too small to fold anymore.)

9. Ask:
    - How many "wedges" in a full circle? (360)
    - How do you know? (360° in a circle)
    - What is the measure of each of these wedges? (1°)

Day 4: Closure

Materials Needed:

- Resource Sheet 7: Exit Ticket

Wrap Up:

1) Distribute Resource Sheet 7: Exit Ticket and allow time for students to complete it.
2) Collect the Exit Ticket from each student and ask them to join you up front for a class discussion.
3) Discussion: Refer back to the motivation.
   - Talk about why something is called a 180, a 360, etc?
   - What would two complete turns be called?
   - Show clip of Shaun White doing a 1260.
     http://www.youtube.com/watch?v=qIr2ki4nWkU
     http://www.youtube.com/watch?v=oF-jmHTYLBQ

Ask student how many turns is a 1260? Prove your answer

Interventions/ Enrichments:

Special Education/Struggling Learners and ELL students:

- Prior to the lesson, consider having struggling students/ELL students view one of the video clips listed in the Motivation section to frontload the idea of angle measures in the real world so that they can contribute to the brainstorming discussion.
- Students who have difficulty visualizing the parts of a circle could color the angles as shown in Activity 2

ELL students

- Provide a vocabulary sheet identifying and illustrating the different types of angles (acute, obtuse, right, straight)

Gifted and Talented

- Babylonians – share what they learn

Challenge problems are included on the exit slip for enrichment purposes

- Resource Sheet 1: Background Information for the Teacher (Read prior to lesson.)
- Resource Sheet 2: Pretest
- Resource Sheet 3: Pretest Answer Key
- Judy clocks (one per student and teacher)
- One of these video clips:
- Kobe Bryant 360 degree dunk
  - http://www.youtube.com/watch?v=jfD8aWe1QdA
- Vince Carter 360 degree dunk

    - http://www.youtube.com/watch?v=4rLL_g3GZtg
- Vince Carter 180 degree dunk
    - http://www.youtube.com/watch?v=7mG4MmddLos
- Straws – 2 per student
- 3-inch length of pipe cleaner – 1 per student
- Resource Sheet 4: Paper Circle (one circle for each student)

- Wax Paper Squares (one for each student)
- Resource Sheet 5: Angle Worksheet
- Resource Sheet 6: Making a Wax Paper Protractor (one for the teacher)
- Resource Sheet 7: Exit Ticket

Summary:
By the end of this activity students should be able to identify three types of angles, know that angles are measured in degrees, and be able to measure angles using protractors or angle rulers.

Prior knowledge needed to complete this activity: Be able to identify parallel, intersecting, and perpendicular lines. By the end of this activity students should be able to identify:

REVIEW:
Right angle: A 90-degree angle
Acute angle: An angle that is less than 90 degrees
Obtuse angle: An angle that is greater than 90 degrees
Know that angles are measured in degrees and develop benchmark angles (e.g. 45 degrees, 60 degrees, 120 degrees) and be able to measure angles using protractors or angle rulers.

Extended Activities to do with your class:

Intended Learning Outcomes:
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

Instructional Procedures:
Invitation to Learn

Divide class into two groups. Have them stand arm length apart in a circle. Give each group a ball of yarn. Instruct them to pass the yarn to make a web. They may not pass the yarn to the person next to them; encourage them to pass across the circle as much as possible. Each child needs to hold onto the yarn and not let go. When they are all holding onto the yarn have them carefully lay their web down on the ground, stretching it slightly so the yarn is in straight lines.

Review parallel, intersecting, and perpendicular lines by finding them within the web. Have students identify the places where the lines intersect and mark them with points. Explain that when two lines meet together at one point we call that the VERTEX and that the lines, which are called rays, extending from the vertex form an ANGLE. Now look at the web to see if you can identify angles. Review how lines are named by points. Explain that angles are named using three points, with the vertex point always in the middle (ABC) and that we use this symbol < for angle. (

Instructional Procedure

1. **Classifying Angles** (Right, acute, obtuse) Before the lesson prepare 12 angle cards. Use cardstock and draw one angle on each card–make 4 right angles, 4 acute angles, and 4 obtuse angles. Label the points and write the angle name.

   Place the angle cards on the board. Ask the class to carefully examine them and see if they can classify them into three groups. Have students come to board and move the angle cards into three groups. Continue working until students have correctly grouped them into right, acute, and obtuse angles. Write the name of each type of angle above the cards. Have class practice reading the names and identify the characteristics of each.

   Identifying Angles

Put students into small groups or partners. Give each group a set of pattern blocks.

Tell them they need to look at each type of pattern block and identify the types of angles on each. Give each student a piece of art paper. Have them divide it into three sections labeled: Right Angle, Obtuse Angle, and Acute Angle. Have them trace the angles of the pattern blocks into the correct section.

2. **Identifying Benchmark Angles using fraction circles**

Give each student a copy of the 360-degree Circle worksheet, which has been copied on cardstock.

Discuss how a circle has 360 degrees. Link it to skateboard and snowboard tricks like the 180 and the 360. As you discuss each one have the students find it on their 360-degree Circle worksheet.

If you divide a circle in half how many degrees to you have? 180. Have them jump and spin and try to land at 180 degrees. Now start at 0 degrees on your circle and trace your finger around to 180 degrees. What about a half of the half? That would be 90 degrees. Jump 90 degrees at a time and see if they can figure out the degrees–link it to the 9 times tables. So if you could jump all the way around you would be doing a 360!

Have students put away their 360 degrees Circle paper so they cannot see it during the following activity. Give each student a piece of 9 x 12 art paper. Put students into partners and give each group a set of fraction circles cut out of foam board. You need to have a whole, halves, fourths, eighths, sixths, and thirds.

Have students fold their art paper to make four boxes. Have them trace their whole circle in each of the boxes on the front and in two boxes on the back. (Total of 6 boxes)

Work with students to identify the benchmark angles.

Begin with the whole circle. Review how many degrees are in a complete circle. Write: “A whole circle has 360 degrees”. Ask how much of the circle 180 degrees would be. Have them find the fraction pieces that would cover half the circle. In the second box have the students trace the halves onto the circle, write 180 degrees on the circle in the correct place, trace the 180-degree angle in crayon and shade it in. Above the circle write “180 degrees is half the circle.” (You can also teach your students that this is called a straight angle)

Note: As you do these fraction pieces make sure they lay the first fraction piece so its baseline is on the 0 degree line of the circle, this will form the angle correctly.

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Note: As you do these fraction pieces make sure they lay the first fraction piece so its baseline is on the 0 degree line of the circle, this will form the angle correctly.

Continue with 90 degrees. Remind them how far they had to jump. How could you relate 90 degrees to a fraction of your circle? Lay your fraction pieces on your circle and see which ones correspond to 90 degrees on the circle. Find the fractions that would make 90-degree angles. Trace the fourths, highlight the first one-fourth, and label 90 degrees on the circle and then above the circle write "90 degrees is 1/4 of the circle". As you work through the rest of these angles have the students compare them to the 90-degree angle to give them a reference point.

Repeat for 45 degrees, 60 degrees, and 120 degrees.

1. **Make an angle manipulative**. Give each student two 1" x 6" strips of oaktag and a fastener.

   Draw a ray on each strip. Mark an endpoint on each ray, then put the strips together to form a vertex and put the fastener through them. Make a larger version for you to use to demonstrate on the board. Have them look at their fraction circle papers and try to reproduce the angles using their angle manipulatives.

2. **Formative Assessment:** Have students use whiteboards or white art paper and crayons. Example: Draw two angles, one 90 degrees and one 45 degrees, on the board or overhead. Instruct students to copy the 90-degree angle. Have them hold up their white boards or papers to check. Continue with other angle comparisons; include right, acute, and obtuse angles also.
3. **Measuring Angles using an angle ruler or protractor**

   Show students an angle ruler and a protractor; explain that these are the tools we use for measuring angles. Demonstrate how they work. Put students into partners and let them experiment with the tools. Draw different angles on the overhead and measure them. Have students draw and measure them with you. Have students use their angle manipulative. Have them work in partners. One student will make an angle using their manipulative; the other student will use the angle ruler or the protractor to measure the angle.

4. **Play "What's Your Angle?"**

Draw angles on the board or overhead. Have students estimate and write down the angle's degrees. Then have students come up and measure. If their estimate is exactly correct they get 10

points. Deduct one point for every degree they are off—if they are one degree off they will get 9 points, continuing down to 9 degrees off they will get 1 point, 10 or more degrees off they will get 0 points. Variation: Play STOP! Use a large angle manipulative on the board. Tape the bottom ray so that it stays at 0 degrees. Identify the degree of angle you want to make. Choose a student to come to the front. Their job is to yell, "STOP" when they think you have made that degree of angle. They can solicit help from the other students. Move the other ray slowly (remember that angles are measured going counterclockwise) The student yells stop when they think you have reached the correct degree. Tape the ray down and measure the angle. Choose your "winner" criteria before starting. Example: They have to be within 5 degrees to win. If they win give them a small treat.

Family Connections

- Have students enlist the help of their families to go on an "Angle Hunt" at their homes. Have them find and describe at least one example of each type of angle.

Assessment Plan:
Use the *Angle Assessment* blackline as a final assessment.

Accommodations/Modifications:

Extensions:

- Struggling learners can be paired with more advanced learners
- Angle Tangle: Assign students to draw 5-7 straight lines with several intersections. Then connect the endpoints of the lines. Mark the angles created within in the design and color code them by right, acute, and obtuse angles. Color the rest of the design.
- String Art: Do a line design but give students string, oaktag, and safe plastic needles. Have them make the design using the string.
- Use AngLegs sets which include connecting pieces to form angles and a protractor that attaches to the pieces for independent practice in measuring angles.
- Integrating Technology: Take a digital camera and take your class on an "Angle Hunt". Have them identify angles in architecture, machines, nature, etc. Take photographs of the students and the angles. Use them to make a Power Point presentation.

Resources (Textbook and Supplemental):

Illustrative Mathematics An online resource with sample items that can be used in class or for assessment

NCTM Illuminations Online tools that can be used by teachers and students to reinforce concepts

http://theteacherscafe.com/teaching-4-md-c-5-a-b-understand-angles-and-concepts-of-angle-measurement/

Spectrum Workbook: pages 116, 117,

Technology:

Links for Motivation Activity:

- Kobe Bryant 360 degree dunk http://www.youtube.com/watch?v=jfD8aWe1QdA
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